THE

# AMERICAN GAS-LIGHT JOURNAL

AND

# MINING REPORTER.

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## PETROLEUM.

### COAL OIL vs. COAL.

To the Editor COAL OIL CIRCULAR:

DEAR SIR,—

I desire to answer some observations made through the press generally, unfavorable to the employment of Petroleum or coal oils for the generation of steam, which observations were based upon the calculated effect of coal and Petroleum.

In answer to which I would state, that the heating value of coal, in practice, cannot be rated from the resultent of a few particles in a chemical experiment; (as is admitted by all competent engineers.) It is for this reason that many things good in principle are not good in practice.

The heating value of 100 pounds of coal, average quality, specific gravity 1.279, is equivalent to raising 812,307 pounds of water 1., centigrade. The heating value of 100 pounds of Petroleum is equivalent to raising 1,231,600 pounds of water 1., centigrade, making the heating value of coal as compared with Petroleum as 1 is to 1·51. This is the calculated value of their component parts. But these comparative results cannot be carried out in practice, by reason of the necessarily imperfect method of burning the coal.

It is true, great and successful improvements have been made in the combustion of solid fuels, from the time of its introduction; but coal cannot be perfectly consumed, unless first converted into gas, as explained hereafter. Some of the solid fuels may be perfectly consumed by the admixture of pure oxygen at the time of consuming. But inasmuch as the oxygen has to be obtained from air, in practice, and is therefore largely diluted with nitrogen, I shall speak of it hereafter in contradistinction to pure oxygen as air.

Air is equivalent to pure oxygen for the purpose of obtaining perfect combustion, only when the material to be consumed is in the shape of gas, and mixed with air in the proper proportion, prior to their union by combustion. The result of such a union with any of the hydrocarbons, would be the same as in pure oxyged, (i. e., water and carbonic acid gas, excepting the nitrogen set free in the employment of air.)

The difference between consuming hydrocarbon fluids in the open air, as from a pan or plate, as compared with consuming the same from a vapor or gaseous state, (where it receives its admixture of air prior to consuming.) is as one for the former to three for the latter in the amount of heat evolved.

In the employment of bituminous coals for furnaces, there is about the same per centage of loss, save where the carbonic oxyd is made use of for generating steam.

There is, without doubt, an average loss of 50 per cent. of the effective heating qualities of bituminous coals, in the present mode of consuming the same, which, unfortunately, there is but limited help for; as the only perfect way of consuming the same, is to convert the coal into gas, which the coal is naturally adverse to, and requires the extra employment of fuel for the conversion of the same, aside from the difficulties of a cumbersome and expensive apparatus, which will always prevent that method being adopted.

This is the point where one of the great differences between the employment of oil and coal exhibits itself in favor of the oil.

The oil is readily converted into vapor or gas, which enables the proper admixture of air, (for the perfect combustion of the oil,) prior to consuming the same.

Fuel is valuable in proportion to the amount of oxygen it will consume. Viewing it in this light, the most effective fuel is found in coal oil, i.e., that which is procured from coal by destructive distillation. The introduction of which oil was the cause of my making a series of experiments to discover the proper mode of burning the same, prior to the commercial discovery of the Well Oil (Petroleum.)

Within a few years, coal oil sold, and was delivered in Philadelphia, for 10 and 12 cts per gallon, in small quantities, at which time an amount to supply any demand could have been procured at the above and lower rates, as coal oil works at that time were in operation, and would have only been necessary to increase their works.

The introduction of Petroleum crowded out the coal oil, and left it without a market, by reason of the superior qualities of Petroleum, it being superior in every respect, except for heating purposes.

Many of the coal oil works that were not convenient for the re-distillation of Petroleum, were left to stand idle, or sold for the old iron which they contained.

Petroleum stands convicted of retarding the progress of the manufacture of coal oils, by giving a much better substitute (for lighting and lubricating purposes.) But there is a sphere for both—the one can furnish light, and the other heat.

The first will illuminate our path, the second will give us power,—both will give us mineral wealth equivalent to any other product.

The superior quality of Petroleum, combined with the tariff provided by Congress, together with tariff Congress did not have to provide for, i. e, the exchange, has caused the price of Petroleum to advance too far for the purpose of a fuel; whereas, coal oil could be sold at the same price now, or at a very little advance over what it did sell for when in full opperation.

Improvements in the manufacture of oils would more than compensate for any extry cost at this day. All that is necessary is, for capitalists to see that there is about to be, and will be, a great market for this species of fuel, when capital will seek investments for the supplying of liquid fuel, the same as they now supply solid fuel. There are thousands of acres of cannel coal, and deposits of bitumen, not inconvenient to any sea port, when transported in the shape of oil. Material that furnishes this liquid hydrocarbon is being found throughout the world where commerce reaches. It can be supplied at any sea port with less inconvenience than coal.

The portable character of the oil will be the means of a large saving in point of handling, as compared with other fuels; as, for instance, a tank, situated on a wharf, for the purpose of loading vessels with fuel, would only require the simple appendage of a hose for leading the oil into a tank of water-tight compartment in the vessel, which could take its load of fuel as readily as a locomotive takes its supply of water along the road. The oil unloads itself from the tank, without the intervention of forty or fifty men for handling the same, as in coal; to say nothing of the delay to the steamer, and the accompanying dirt and dust.

It is supposed the oil is dangerous, as it is easily ignited; whereas, it is safer than coal, as the oil is conveyed in iron tanks, and cannot, therefore, be ignited until drawn therefrom, which operation is performed by a pump, and removes the oil in proper quantities from the tanks to the fire-box, where it is consumed and controlled at will.

In case of a collapse of a flue, or internal leak in the boiler, the liability of firing the vessel is very great, as the steam, in blowing through the furnace, carries the fire with it, setting the neighboring portions of wood on fire, and causing the men to leave their post.

The oil would be provided for an emergency of this kind, as the supply could be immediately cut off, which would extinguish the fire in one minute; whereas, it is a matter of from one to two hours to extinguish a coal fire under a large furnace.

As a fuel, the oil is superior to coal, in every respect, upon the ocean.

For further information, I would refer you to the Report of the Chief Engineers, W. W. W. Wood, John P. Whipple, and Alben C. Steimers, upon the Employment of Ignitible Fluids for the generation of Steam, issued in phamphlet form by the American Coal Oil Steam Company, No. 33 Pine street, New York.

Respectfully Yours,

THOMAS SHAW.

### SPECIFIC GRAVITY OF COAL OILS, AND HOW THE TEST MAY BE APPLIED.

BY JOHN TAGLIABUE.

A question which is now more than ever agitated, causing a vast deal of trouble in the coal oil trade, especially to the mercantile portion of it, is as to the correct reading and consequent statements of the different specific gravities of the oil. As to the greater or less importance of the true gravity of the oil, the writer does not permit himself to discuss that now; he assumes it to be of vast importance, if it be the cause, as in several instances it appears to have been, from the returns to the seller of quite large consignments of of oil solely upon the ground of the gravity not being that which was ordered, and represented to be by the seller.

The scale which manufacturers and dealers in the article in the United States insist upon using, on account of its apparent simplicity and plainness, is that of Beaume, which, in the hydrometer for light fluids (that is, fluids lighter than water,) has 10° as the starting point, or water, and runs up to 70 or 80°, as the case may be. Now, there is, doubtless, a perfectly defined and positive meaning to these degrees; but the difficulty consists in this, that no one seems to know where such perfect definitions may be found. We may consult half a dozen of the very best works extant, works which, upon most scientific subjects, are considered as authorities, for example, Dr. Ure's "Dictionary," Booth's "Encyclopædia of Chemistry," Brande's "Cyclopædia," and in each we shall find a different statement of the actual weight of a liquid which marks, say 45° Beaume; and this difference of statement we shall find, not perhaps in the three works above named, but, in the course of our researches, in others equally as good, to amount to full one degree of Beaume's scale, and this great difference is totally independent of the good or bad, correct or incorrect, mode of manu-

facture of the hydrometers in use for ascertaining the gravity of the oils. If to this we make allowance for the imperfection of manufacture by inferior, or oftentimes absolutely dishonest artisans, whose only idea is to make, or to get made for them, instruments at prices which do not permit an amount of care sufficient to produce a correct scale, we need have no difficulty in accounting for the discrepancies which are found to exist between the statements, not only of consignors and consignees, but between "inspectors of Petroleum;" for, as the above statement proves, not only are the actual instruments kept for sale very defective, but even those upon which the utmost care is bestowed by two makers of equal ability may differ, owing to the fact that there is really no perfect standard existing which is absolutely beyond question; from the facts above stated, it must be understood that the scale in question is not itself a basis, but merely rests upon a certain degree of specific gravity, which phrase itself means a weight of so many ounces per gallon, quart, or some positively stated volume of the fluid in question compared with distilled water, which weighs so much per similar volume.

These being, then, the difficulties as at present existing, the question for those engaged in the trade is, How may they be overcome or remedied? And the reply is, only by the same means which have heretofore been adopted by other trades in which this same question was of great pecuniary importance, as in the case of rectified spirits, this having been subject to a considerable amount of taxation (although, of course, nothing compared to that which it at present bears) which taxation was on the actual amount of the alcoholic contents of the liquors, and not upon the simple volume or quantity of the liquors. The Government became thus an interested party, and employed certain well-known professors to fix the standard for such instruments as were needed; and the result was, the production of a standard of spirits against which there could be no appeal.

Now in the case of Petroleum, the same method can be adopted, and is the only means by which a standard can be procured—and this is a work, not for an individual, nor for, perhaps, a single association; although it may possibly be accomplished by an association, if carried out faithfully, and the various steps proved publicly by a committee appointed for the purpose, and consisting of parties not likely to be biased in any way in the matter. But it is a work which, to be effective, must have the assent of all as to its fairness; and if not their assent, at least the assurance and means of proof sufficient to establish, before any court of justice, the correctness of the means adopted to accomplish the results by which the case in dispute has to be determined.

The suggestions which, if adopted, would accomplish the object in view, are as follows:

1. Let each of two or more associations of manufacturers of, and dealers in, the article in question, appoint a committee to act each with the others in the employment of such persons as are fitted to accomplish the object in view. This, of course, in order to place the work, when finished, beyond question, as it would not be if it were left to any one party, or to any one association, to perform; this being done,

2. Let every step in the following plan for accomplishing the work be announced when ready for the inspection of said committee; or let one of each committee form a joint committee, to be present at the verification of each step of the work as it progresses.

The plan for the accomplishment of the work is as follows:

A chemist of well-known reputation should be employed to prepare solutions of the following specific gravities, first getting distilled water at 60° temperature for the water point of Beaume, or 1000 specific gravity.

| | | | | |
|---|---|---|---|---|
| 2, | a solution about | 20o | Beaume. | |
| 3 | " | " | 30° | " |
| 4 | " | " | 40° | " |
| 5 | " | " | 50° | " |
| 6 | " | " | 60° | " |
| 7 | " | " | 70° | " |

Before these are prepared, a hydrometer maker should be employed to prepare hydrometers of such delicacy as would show as closely as one-eighth to one-tenth of a degree Beaume, and thus an actual ascertainment of the exact degree of said hydrometer at which it floats in the respective solutions can be obtained, and (supposing the degrees of said hydrometer not to be, as it is more than probable that they would not be, in perfect accordance with the weights of solutions as given by the chemist) thus a standard is obtained which is ever afterward capable of verifying the exact weight of the respective solutions, as solutions thus prepared must be capable of verifying its correctness.

This being accomplished, it is then the business of an hydrometer maker to make copies of such standard instrument, which will be themselves standards, and, if properly made, be beyond dispute; while, if properly made, the original standard or standards—which, it is to be understood, shall be placed in the keeping of some one who can not himself get access to them without the help of certain other parties, who shall hold the means of access—are at hand to expose to inaccuracy.

But it may reasonably be urged that the above plan is open to several objections, which, as the writer proceeds, easily present themselves to his mind, among which are the following:

When the respective solutions are prepared, and the hydrometers introduced into them, and the exact correction or notation of said hydrometer scales made, how shall the hydrometer maker be able to produce his copies of them, if he is not to be allowed to take them? For if allowed to take them, of course, no guarantee then exists of their being unaltered, and all the work hitherto entered upon, with this sole object, is neutralized. This can be obviated in either of the following ways: either by the insertion of two similar hydrometers, as prepared, into the solutions, one of which shall be deposited at once with the parties authorized to receive it, the other to be handed to the maker to prepare copies from for the the members of the association interested, and the trade generally; or, after the first observation, the respective solutions are noted, the standard shall be handed to the maker, and when a copy of the same have been afterward prepared, a second trial can be had of the original, with the copy, and then each can be deposited, as before stated, the one to serve henceforth as a perfect standard, in case of dispute, the other to serve as a standard instrument for the manufacture of correct hydrometers for crude or refined Petroleum.

# MINING.

## DESCRIPTION OF THE UNIVERSAL BLAST AND SMELTING FURNACE INVENTED BY THE RUSSIAN MINING ENGINEER AND MAJOR-GENERAL WOLDEMAR RACHETTE.*

This invention is succesfully introduced and patented in Russia, France, England, Belgium, Austria, Sweden, &c., and was at the World's Fair of 1862 rewarded with the prize medal.

Success after success has met the practical introduction of General Rachette's new system of Blast and Smelting furnaces in Europe. Russia, France and Germany give the most enthusiastic accounts of the results that have been obtained in their use

Careful comparison has elicited the following advantages:

I. A saving of about one-half in material and labor, and of more than double in time at their first construction.

II. A greatly increased yield, 3½ times greater than is obtained from furnaces of old construction of equal area.

III. A saving of fuel, averaging from 9 to 15 per cent.

IV. An easier management of the process, and a more perfect reduction of the ores.

V. A better and more uniform quality of cast iron.

VI. A longer smelting period and better preservation of the furnaces.

These results have been obtained in a number of large furnaces that have been worked during the last two years in Russia, at the large iron and copper smelting works of Prince Demidoff at Nischne Tagilsk. They have also been verified and confirmed by the results obtained in furnaces erected in France, Germany and England. Will our iron masters follow in the wake of progress? Prejudices must finally give way to stubbon facts.

This new system of furnaces is no theory, or result of small experiments; it is a tested and fully successful invention, which deserves our full attention and should find a speedy introduction in this country.

I will now proceed to point out the peculiar features by which General Rochette's *Universal Blast and Smelting furnace* is distinguished from the furnaces of older construction and such as now in use.

This furnace is called "Universal," because experience has shown that this system, with but very slight modification, can with success be adopted for smelting copper, nickel, tin, lead, silver, gold and other ores. *Cast-steel* has been melted in one of these furnaces, and even *Platinum* is said to have yielded to the intense temperature before the mouth of the tuyere.

The hearth has the shape of an elongated rectangle; the interior of the furnace rises up to an inverted square pyramid. The shape of the furnace, narrow, long and proportionally low, grows wider at the tunnel head; it is furnished with a double series of tuyeres, or blast-tubes, arranged in alternate, interchanging order. This furnace has further two working sides or tymps, and has under its hearth, and all through the walls, a system of channels and flues, by means of which the furnace, even while it is being built, is dried from outside to inside, and is afterwards ventilated, in order to preserve the walls of the furnace from being too much expanded and injured by the accumulating heat.

As it may be desirous for some reader to understand the reason why a system of such furnaces has produced so extraordinary results, I will here give a digest of extracts from several European publications:

A. All furnaces of the old system have boshes which contract toward the tunnel head, and thereby at first hasten and then retard the descent of the charges, in order to prolong the time of their exposure to the ascending gases. They are built high (50 to 60 feet) to prevent too great a loss of heat at the tunnel head, and require a consiedrable pressure of blast. In the furnaces of old construction, the charge remains about 24 hours. In the Rachette blast-furnace, only 25 to 30 feet high, we find the tunnel or inside of furnace gradually widening toward the top, giving thereby to the charges a uniform and unobstructed descent. The pressure of blast is most materially diminished, and the intense heat produced at the tuyeres during its passage upwards, over a continually increasing area, becomes more distributed, easier absorbed and tempered. The charges remain only seven hours in the furnace and are fully reduced during their gradual and regular descent.

B. The use of a larger or smaller number of tuyeres in the old system of round or oval furnaces, and their relative position, has been subject to many discussions, without however being decided one way or the other; all iron-masters, however, seem to agree in the one point, namely, to place the mouths of the tuyeres towards the center or opposite each other.

In Rachette's furnace the position of the tuyeres, and their arrangement, is peculiar and different from others. The openings of the tuyeres are not facing each other, but are arranged in an interchanging order. The most intense heat has been found to be about two inches before the mouth of the tuyere; it is therefore easily comprehensible that the number of foci is increased, and thereby a larger extent of melting zone obtained. Five or six tuyeres on each side have been used in Rachette's European blast-furnaces, about one foot distant from the other. The General has modified

*Letters patent in the United States have been issued to the Assignee, Mr. Alexander Trippel, Chemist and Metallurgist, in Bethlehem, Pennsylvania.

the single tuyers into a system of "slit-blast boxes" with several openings. The rotary motion that is imparted to the fusing metal may very likely facilitate the rapid reduction.

C. The furnaces of older construction, and such as are now in use, are all dried out and heated from the inside to outside, a very tedious, costly and time consuming process, requiring much care and judgment, occupying, after the furnace is built, from three to four months, before it is ready for use.

In the new system of General Rachette's furnaces, the drying and heating, as well as ventilating of the walls is done in the reverse order, from the outside to the inside. The drying of the furnace is carried on while the same is being built, so that the furnace, when completed, can be set to work without further delay. Even in the winter time, have furnaces been erected and successfully dried out and heated. The last furnace erected on this system at Mulheim, in Germany, was completed in four months, and immediately without further delay set to work.

There is a system of channels and flues which beginning under the hearth, branch out in vertical and horizontal directions, through the walls, up to the top of the furnace. When the smelting process has begun, the circulating atmospherric air carries off the radineting heat from the walls of the furnace and prevents them from becoming overheated and destroyed, by sudden changes of temperature. The advantages of this heating and ventilating arrangement may be summed up as follows:

*a.* Saving of time, labor and material in the first construction of the furnace.

*b.* A great economy in fuel in the drying and heating process itself.

*c.* A most decided beneficial ventilating effect.

*d.* A greater durability and working capacity of the furnace.

*e.* It prevents many difficulties and mishaps, occurring frequently in furnaces of old construction, such as chilling or clogging up, &c., and facilitates the process and working most effectually.

D. The Rachette furnace has two tymps or working sides. The great increase of yield and the rapidity of smelting process make an increase of working space for tapping, casting, &c., necessary, and this also facilitates the work.

E. The charges in this furnace are made in the same way as in the furnaces of old construction, with this difference, that the ore and flux are placed more around the outer edges of the tunnel head while the coal is placed more towards the middle. Experience has shown that, by this mode of charging, whereby the ore and flux are brought nearer to the mouth of the tuyeres, leaving the fuel more towards the center, a decided saving in fuel, as well as also a more complete reduction of the ores, are obtained.

F. The great yield that results in this system of furnaces make it admirably adapted for *cupola* and refining furnaces; also for melting larger quantities of *cast*-steel, which Mr. Charles Aubel, the constructer of these furnaces in Europe, says has been tried with success in Russia. For casting heavy ordnance and large pieces of machinery, this system of furnaces can be warmly recommended.

A. L. Fleury.

*New York, July* 30, 1864.

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Profitable Mining in America.—The well-known Cliff Copper Mine of Lake Superior has returned $1,600,000 upon an outlay of $66,000, and the value of the mine is now estimated at not less than $3,000,000. The Cleveland Iron Mining Company have declared an extra dividend of 5 per cent. The income for the last year was nearly $400,000, and the company have at present 235,000l. surplus in hand. The yield of the 37 silver mines in Nevada territory is estimated at $1,000,000 per month, and of this the Gould and Curry Mine furnishes nearly one-half. The Heckendorn Company of Blue Mountain have obtained 94 lbs. 4oz. of gold from 33 tons of rock; the rock will pay about 45l per ton.

## REPORT OF THE PROPERTY OF THE COLUMBIA GOLD MINING CO., OF COLORADO.

The following report has been received from A. Z. Huggins, Esq., who was sent out from New York City expressly to examine the titles and merits of the mining property of the Company, located in the gold regions of Colorado Territory:

New York, July 13th, 1864.

To the President and Directors of the Columbia Gold Mining Company:—

Gentlemen,—Having just returned from Central City, Colorado, I beg leave to submit my report of the gold mines, and of the particular property which I was delegated to examine, as follows:

The mines are westerly from Atchison, Kansas, a distance of about 700 miles, by the stage route. The route is entirely over prairies, called "The Plains," and runs northwesterly through Kansas to Fort Kearney, in Nebraska, about 230 miles, thence westerly along the banks of the Platte River, to Latham, about 35 miles, and thence southwesterly about 70 miles, along the South Platte, to Denver City, in Colorado. Denver is about 15 miles from the base of the mountains, and 40 miles from Central City.

Your three claims on the Bobtail and Fisk Lodes are situated on the side of Gregory Hill, a very short distance from the dry gulch that seperates the Gregory from the Bobtail Hill. No. 5 west on the Bobtail crosses No. 5 west on the Fisk, near its junction with No. 4. The Bobtail claim has two shafts, sunk respectively about 40 to 70 feet, and thus far has produced quartz entirely similar in appearence and richness to what has been taken from the same depths in the other claims on this lead. Every one acquainted with this claim, with whom I have conversed, agrees in the opinion that it is as rich in its deposits, and every way as valuable as the most noted claims on this celebrated lead; and it has this advantage over the others, that it is better located for work, and more easily accessible, as it lies at a lower point on the road and nearer the Gregory Gulch.

No. 5 west on the Fisk has been shafted 110 feet, and has produced from the surface down, from two to four hundred dollars per cord by the old milling process. This is in gold, and probably not more than one quarter of what was actually contained in the quartz. I have the best authority for saying, that could the quartz at the bottom of this shaft be perfectly milled, its yield would not fall short of $1,500 per cord. No. 4 has been shafted in two places, to the respective depths of about 40 and 60 feet.

These claims are precisely the same in character with the other developed claims on the lead, and together with the claim on the Bobtail, form one of the most compact, easily accessible and desirable pieces of property in the mountains. Any one of the three claims I believe to be more than equal in intrinsic value to the cost of the entire property; but when the three are considered in a body, with their convenience of location, and the advantage they possess of being easily operated with a single engine and at a comparatively small expense, their real value can hadrly be over-estimated.

The water power and mill included in your purchase, are situated about a half mile below Black Hawk on North Clear Creek. The water-power I deem to be very valuable, for reasons which I have already given. Although there is no doubt that coal will soon find its way to the mines, yet a water-mill is worked at a much less expense than a steam-mill, and hence will always be held as of very great value.

This water right is 465 feet in length, and has a fall of 21 feet. There is sufficient water in the creek to run almost any number of stamps during a greater part of the year; and even in the dryest season, I should think the volume would be sufficient to run as many as 30 stamps.

The mill is in good condition, excepting the flume, which was broken away at the time of the Denver flood, two days before my arrival at Central City. The cost of repairing this, will not exceed $100. The mill was running regularly until the breaking of the flume, and crushing daily from a cord to a cord and a quarter of qurrtz.

In one week's time, the flume could be repaired and the mill and claims be in full operation. Should the Company deem it advisable, work could constantly be going on to the full capacity of the mill, at the same time that the improvements are being made preparatory to a more extensive business. The expense of mining and running the mill would not be over $100 per cord, while the gross receipts, if one cord were crushed each day, of quartz taken from the bottom of the deepest shaft, would amount to about $400 in gold; making a daily net profit of $300. The tailings could be saved, until the proper machinery should be in order, to take out the remainder of the gold.

Unfortunately, Mr. Nicolay's letters requesting me to examine the Castle property, failed to reach me in Central City, and as the transaction took place after I left, I was in entire ignorance that this was to be connected with the property I was delegated to examine. I have some knowledge of the property, however, and take pleasure in saying that I believe it to be good.

The Tunnel claim is beyond question very valuable. Mining by tunneling has but recently been inaugurated in the mountains, yet this is now getting to be the most popular mode of taking out the quartz. Besides its convenience, it has several advantages over claiming and working from the surface. In preempting a tunnel claim one person can hold 5,000 or more feet in length, and whenever a lead is crossed that has not been preempted, the owner of the tunnel is entitled to 500 feet of it by virtue of his tunnel right. Hence, a single tunnel claim may hold thousands of feet of good gold-bearing lodes, whereas no one man can preempt more than one claim of 100 feet besides the discovery, if he claims on the surface. Another advantage is, that when a new lead is struck, it is likely to be so far below the surface as at once to ensure good pay. This tunnel, therefore, is more than likely to be of great value, aside from the fact of its connection with the Fisk lead.

My acquaintance with the other leads in this purchase is too limited to justify any further remarks than that they are favorably located and have a good general reputation.

Of the value of your property, you can form an idea by examining the capacities of the more developed portion, to wit, the mill and Fisk and Bobtail claims.

Your present mill, with its twelve stamps, can crush to the size of a hickory nut five cords of quartz per day. If the Gardiner "Muller" is used in connection with the stamps, and proves as good as represented, and as it appears to be, it will be much more than capable of pulverizing and amalgamating the five cords of quartz per day as it comes from the stamps. The three claims, with the necessary machinery, could supply twice this amount. Suppose that only $500 per cord were realized, and this certainly is below what may reasonably be expected, from the five cords per day, you would receive the gross daily income of $2,500, or, counting 300 days to the year, the gross annual income of $750,000, and that in gold. Allowing $100 per cord for expenses your net income would be $600,000 per annum. Were you to double your stamping power, and increase your force at the claims so as to enable you to work ten cords per day instead of five, at the above rates this property would net you $1,200,000 per annum, an amount exactly equal to the par value of the entire stock of your Company.

These figures are entirely reasonable, and I think will fully justify me in assuring you that, with proper management, you may rely upon, and confidently promise to parties interested, a net annual profit of at least 25 per cent. in gold on the par value of your entire capital stock, from this portion of your property alone. This is larger than my former estimates, for the reason that I have now more confidence in the ability of the machinery likely to be introduced to crush the ores and extract the gold.

In closing my remarks, I desire to say, that in my opinion you have a very fine property, and that if the Castle portion proves as productive as the other, and

intrinsically it is doubtless more valuable, you cannot fail to realize very large profits on your investment.

Very respectfully yours,

A. Z. Huggins.

## THE OLD MINES OF MEXICO.

From the records of the past we may often discern or speculate with some certainty on the course of the future; and now that recent events have turned the attention of Europe to Mexico, we believe that we shall be doing good service when we recall a few facts as to the old mines of that interesting quarter of the world. One fact cannot be denied, that if metallurgy has made immense strides in consequence of the metalliferous discoveries which have characterised the nineteenth century, Mexico has not waited for the development of science in order to give to the world a large share of the wealth with which she has been endowed by Providence. On the contrary, with extremely restricted means, this country has drawn from its mines unheard of results. The mineral wealth of California has enjoyed this advantage; incontestable as it was prodigious, it has fallen into the hands of a people the best adapted to bring it out in strong relief. It is not enough for a merchant to have fine merchandise, as upon his power of making it please the eyes a good deal of his reputation depends; and it is probable that, in the hands of another nation, California would have been far from promising only that which she has already yielded; at the same time, it may, perhaps, be said that, notwithstanding the marvellous results attained, no Californian mine has at present acquired the justly merited celebrity of some of the old veins of Mexico. Many facts might be cited in support of this assertion, but we will content ourselves with the following, merely remarking that the totals advanced may be considered as authentic, being based upon the amount of dues levied by the Spanish Crown previously to 1822 those dues representing one-fifth of the total production.

The mines of El Lacal and La Biscaina, in the province of Mexico, worked by one Cedro Tereros (crented subsequently Count de Regla, in consideration of the magnificent presents which he made to the Spanish Crown), produced, to 1762, 868,320*l*. From this period to 1774 the production left a net profit of 1,200,000*l*., after having paid 240,000*l*. for expenses of working and the establishment of two haciendas at San Antonio and Regla. From 1794 to 1801 the nett profit was still 1,200,000*l*. The Veta Madre at Guanajuator, comprising some direct ramifications, produced from 1766 to 1825, judged by the fifth paid to the Crown, and the accounts kept, 45,187,157*l*. The Valenciana Mine, to the north of the town of Guanajuato, was first worked by some poor people, but at a depth of 80 yards they met with a vein which produced from 1788 to 1810 an annual average of 276,639*l*., which left to the workers a clear nett profit of 105,540*l*. If it be desired to form an idea of the fabulous sums expended in the working of these great mines, the case of the Valenciana Mine may be cited by way of illustration. Thus the different pits sunk in the working of this mine cost the following sums:—El Tiro Viejo de San Antonio, 79,200*l*.; Burgos and San Ramon, 16,400*l*.; the hexagonal pit of Nuestra Senora de Guadaloupe, 140,000*l*.; and, finally, El Tiro General commenced in 1801, and stopped at the period of the revolution—or rather the revolt from the yoke of the parent state—when it had attained a depth of 635 varas, or 1693 ft., 200,000*l*. The Santa Anita Mine, situated on the Veta Madred de Guanajuato, on which a pit known as the San Miguel was sunk at an expense of 140,000*l*., gave a first profit of 2,200,000*l*. The vein of Catorce, in the province of San Luis Potosi, was in full working from 1781 to 1783, and Father Flores, of the Company of Jesus, received for his share during those two years the sum of 700,000*l*. The Catorce mineral, it may be added, sold on the opening of the mine at 4s. 2d per lb. The Pavellon Mine, in the Zacatecas, paid to the Crown, as the fifth of its total production during ten years, 2,400,000*l*., which would carry its annual production to 1,200,000*l*. Don Jose Mariano Fagoago, who directed at a later period the works of this mine, and carried out some very extensive operations, derived from them in eight months, according to the registers of the Royal Treasury, the immense sum of 2,800,000*l*. But such was the imperfection of the means of reduction, &c., which then existed, that Don Jose was not less than nine years in reducing the mineral which he had extracted in eight months. The Abra Mine, in the neighborhood of Guarisamez, in the Zacatecas, under the direction of Senor Zambrann, yielded in 25 years, to the King of Spain for his fifth, 2,200,000*l*. Let us further mention the mine of Nuestra Senora de Guadaloupe, in the district of Cosala (State of Sinaloa), worked in 1825 under the direction of Don Francisco Iriarte, who refused to let it to an English company for 200,000*l*., and who did much better with it; at any rate, according to his own account. The mine of Agua Caliente, in the district of San Ignacio, prospered from 1801 to 1815, when it was worked by three families—the Picos, the Nieto, and the Urrias. The yield was so rich that there was scarcely a member of these families who had not the most ordinary utensils of his household of silver, while the broker charged with the sale of the silver produced realised 8400*l*. for his commission during two years.

If the Mexican mines yielded in old times such striking results, although worked with very imperfect processes, what may be hoped for from them when steam and other modern improvements are applied to their development? Nevertheless, there are persons who carry their scepticism so far as to call in question the wealth of the mines of Mexico. It must be folly or ignorance to do so, and with good government we doubt not that Mexico will again deliver very great quantities of the precious metals to the world. There is nothing which so checks national progress as individual insecurity.

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The Mineral Statistics of the United Kingdom, for the year 1863, by Robert Hunt, F. R. S., Keeper of Mining Records of Great Britain. The London Mining Journal of August 6th, gives us the following summary:

Gold.—The quantity of gold produced from two British Mines amounted to 552ozs., of the value of 1747*l*.; the returns for 1862 being 5299 ozs., of the value of 20,390*l*.

Tin.—The tin ore (black tin) smelted in 1863 amounted to 15,157 tons according to the returns of sales made each month by the tin smelters; the returns as shown by the dues paid to the Stannary Court giving 14,224 tons. This arises from the circumstance that, although the ore may have been sold in December, the dues on that ore may not be paid for a month or more after the sale. The actual increase in the quantity of tin ore raised and sold in 1863 was 830 tons, the quantity of metallic tin (white tin) produced being 10,000 tons.

Copper.—The production of copper from British mines still exhibits a falling off. During last year 210,947 tons of this mineral were produced from 22 mines, the quantity in 1862 having been 224,171 tons. This ore yielded to the smelter 14,246 tons of copper.

Lead.—The mines of the United Kingdum gave 91,238 tons of ore during the year, against 95,311 tons produced in 1862. Of lead we obtained from this ore 68,220 tons, the value of this metal being 1,418,985*l*.

Silver.—The lead obtained gave 613,266 ozs. of silver; to this must be added 20,738 ozs. produced from ores so excessively rich in silver as to be returned as silver ores, making altogether 634,004 ozs., of the value of 174,351*l*.

Zinc.—The production of zinc ore has somewhat increased, the quantities sold in 1863 amounting to 13,699 tons, which gave 3835 tons of metallic zinc, of the value of 90,889*l*.

Pyrites—Sulphur Ores.—The quantities of these ores obtained from British mines still exhibit a decline of 85,376 tons, of the value of 62,035*l*., being the produce of 1863, against 98,433 tons produced in 1862. The ores, however, fetched a higher price.

Iron.—Of iron ores of different kinds 9,088,060 tons were obtained. This was employed in making 4,510,040 tons of pig-iron, having the value of 11,275,100*l*.

Coal.—There has been a large increase in the production of this mineral, 86,292,215 tons having been sold and used. The export trade has been less active than usual, therefore the employment of this large quantity is entirely due to the demands of British manufacturers.

General Summary of which Returns are given for 1863.

| Minerals. | Quantity. | Value. |
|---|---|---|
| Gold quartz.....Tons | 385.... | £ 1,500 |
| Tin ore..... | 15,157.... | 963,985 |
| Copper ore..... | 212,947... | 1,100,554 |
| Lead ore..... | 91,283... | 1,193,530 |
| Silver ore. ..... | 88 ..... | 5,703 |
| Zinc ore..... | 12,941 | 29,968 |
| Pyrites..... | 95,376.... | 62,035 |
| Wolfram..... | 13 ..... | 67 |
| Uranium.....Cwts. | 3 ..... | 23 |
| Gossans.....Tons | 4,424 .... | 4,576 |
| Arsenic ..... | 1,444 .... | 1,200 |
| Iron ore ..... | 9,101,552 . | 3,240,890 |
| Coal (sold and used)..... | 86,292,215 | 20,272,949 |
| Earthy minerals (estimated). | | 1,975,000 |

Total value of minerals produced in 1863 ..£29,151,976

Metals produced from British Minerals and Coals.

| | | |
|---|---|---|
| Gold..... .....Ozs | 552.. £ | 1,747 |
| Tin.....Tons | 10,006.... | 1,170,702 |
| Copper..... | 14.247.... | 1,409,608 |
| Lead.. ..... | 68,220.... | 1,418,985 |
| Silver.....Ozs | 634,004.... | 174,351 |
| Zinc.....Tons | 3,835.... | 90,889 |
| Iron, Pig..... | 4,510,040.... | 11,275,100 |

| | |
|---|---|
| Total value of the above.....£ | 15,541,383 |
| Estimated value of other metals.. ... | 250 000 |
| Coals.... ..... | 20,275,945 |
| Total value of the metals obtained and coals produced in 1863..... £ | 36,364,327 |

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Gold in Crystal.—The question has frequently been raised, whether gold has ever been found in a crystal of quartz, and, although several specimens showing such a combination have been submitted to us from time to time, we have never until lately seen one where the crystal has been pure, and the specimen quite free from some admixture of quartz itself. Mr. Edge, a shareholder in one of the claims on Castle Reef, Raspberry Creek, recently showed us a single crystal, quite derserving of its name, of fair size, in the side of which there was a hollow containing a little lump of gold. The precious metal filled up its transparent nest and protruded a little beyond, the crystal was otherwise perfect, and, altogether, a little gem of its kind.—*Dicker's Australian Mining Record.*

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Depth of Coal Beds.—Heath's mine in Virginia is represented to contain a coal bed fifty feet in thickness; a coal bed near Wilkesbarra, Pa., is said to be twenty-five feet thick; at Mauch Chuck is a coal bed forty to fifty feet deep, and in the basin of the Schuylkill are fifty alternate seams of coal, twenty-five of which are more than three feet in thickness. In Nova Scotia is a coal formation fourteen hundred feet deep, and containing seventy-five alternate layers of coal. The Whitehaven coal mine in England has been worked twelve hundred feet deep, and extends a mile under the sea, and the Newcastle coal mine in the same country has been worked to the depth of fifteen hundred feet, and bored to a similar additional depth, without finding the bottom of the coal measure.

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The Ohio oil wells, coal beds, salt works, and iron mines are being worked more extensively than ever before, and the owners and operators are realizing large fortunes. One man who could not buy a hat a few weeks ago, has struck an oil well which he now holds at $100,000.—*Oil Trade Review.*

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Russia gets $20,000,000 of gold a year from the Ural mountains.

# GAS.

## ON ARTIFICIAL ILLUMINATION.

By Edward Frankland, Esq., F. R. S.

It is of great importance that gas, as a light-giving material, should be improved to the utmost possible extent, so as to make it a perfect source of light. Its conveniences are so patent to every one, its use is attended with so few discomforts, and the light is obtained with such facility, and of any desired intensity within certain limits, that there is, perhaps, no source of artificial light capable of such general application. Nevertheless, this is one of the modes of illumination which, having been long previously in use, have not made great progress during the past ten years. The sulphur compounds, which at the commencement of that time were complained of as being present in purified gas, are still there in considerable, if not in undiminished quantity, although there has recently been a process devised by means of which these impurities can be, to a great extent, got rid of. It remains to be seen whether this process be applicable, on a large scale, in the gas manufactury; but, so far as can be judged from experiments made upon a small scale, it is a process which is likely to be very effective. It is the invention of Rev. Mr. Bowditch, of Wakefield. These sulphur compounds are irremoveable in the ordinary process of purification. The gas may be passed in the usual manner over hydrate of lime, or the peroxide of iron; but this operation does not, in the slightest degree, affect the sulphur compounds in question. During the combustion of the gas, however, their sulphur is converted into sulphurous acid, which diffuses itself into the apartment in which the gas is burned, and a great deal of the discomfort of which many complain in the use of gas is due to this cause. Mr. Bowditch discovered that though cold hydrate of lime will not remove these impurities, they are to a great extent got rid of by heating the hydrate of lime to a temperature varying from the boiling point of water up to 400° or 500° Fahr., a temperature of 400° being the most convenient for the development of the effects of his process. The heated hydrate of lime converts the sulphur compounds into sulphuretted hydrogen and carbonic acid, which can then be removed by the ordinary purifying material—cold hydrate of lime. This process has been found by repeated experiments to remove all but about 2 or 3 grains of sulphur per 100 cubic feet of gas, the quantity of sulphur originally contained in the gas varying from 5 or 6 grains up to 20 grains in 100 cubic feet. Heated hydrate of lime was shown to develop sulphuretted hydrogen from the gas supplied to the Institution.

Another recently ascertained fact in connexion with gas is the discovery of a new illuminating constituent recently made by M. Berthelot. This is a gaseous body, called acetylene, which is produced under very peculiar circumstances. Unlike all other hydrocarbons with which we were formerly acquainted, an intense heat is favorable to the production of this body. For instance, it is produced when coke is very intensely ignited in hydrogen gas; and Dr. Odling has recently demonstrated that two of the constituents of coal-gas light carburetted hydrogen and carbonic oxide, which are useless for lighting purposes, may, by means of strong ignition, be made to form acetylene, and thus become luminiferous agents. It has recently been considered important to preserve a moderate degree of heat in gas-making in order to prevent the destruction of the luminiferous hydro-carbons; but the discovery of the formation of acetylene, under the circumstances named, will render it necessary to investigate how far the production of this substance can be carried on upon a large scale, and rendered valuable for increasing the illuminating power of gas. The subject is yet in embryo; but it has an important bearing upon the future progress of gas-lighting. Acetylene and olefiant gas contain, in equal volumes, the same amount of carbon, but the former contains only half as much hydrogen as the latter; consequently, the illuminating power of acetylene is probably at least double that of the olefiant gas.

The compound of acetylene with copper, is a substance not altogether devoid of interest to the gas manufacturer. When it attains a certain heat, it explodes with considerable violence, and the same effect may be produced by friction. It has been demonstrated recently, that acetylene of copper can be produced by the passage of ordinary coal-gas, containing, as it does, a trace of ammonia, through copper or brass tubes, and explosions which have taken place through cleaning out such tubes, resulting in serious injury to workmen, have been doubtless due to the presence of this substance. It is, of course, obvious that an explosion of this kind, even if slight in itself, may be communicated to explosive mixtures of gas and air (in a gas-holder or gas-meter, for instance), and may thus lead to very disastrous results. An explosion of this kind occurred a few years ago in Lancashire. A large meter had been detached, and brought into the open air; a workman was unscrewing one of the brass connexions, when the meter exploded with a loud report. The explosion could not be accounted for, as all the eye-witnesses were positive that no ignited body of any kind was near the meter.

Every method of artificial illumination depends upon the heating of certain bodies to such a temperature that they become incandescent. With gases this temperature is much higher than with liquids or solids. There is only one instance in which the incandescence of vapor is used, and that is the mercurial electric light. In all other cases the incandescence of solid bodies is employed. In the ordinary method of obtaining the electric light, the incandescence of solid prisms of carbon is the source of luminosity. In gas and oil flames, it is the incandescence of little particles of carbon, and in all these cases the light is produced from solid matter. The luminosity of any flame depends, first, upon the number of solid particles which exist in it at any given moment; and, secondly, upon the temperature of the flame. The number of solid particles is dependent upon the nature of the flame itself, whether it be a flame produced by the burning of bodies rich in hydrocarbons, or by the burning of bodies which are poorer in this respect. Such a flame is always affected by the pressure of the atmosphere. The higher the pressure of the air, the greater the number of luminous particles of carbon present at one time in the flame. If, after the barometer has been standing at 30 inches, it falls to 29 inches, the light of all flames is reduced to the extent of 5 per cent. The temperature, upon which the luminosity of a flame also depends, may be increased by heating both the gas and air supplied to it for combustion, before they are brought together to be burned.

The speaker exhibited a gas lamp which he had constructed to effect this object. It consisted of an ordinary Argand burner, with glass chimney, but furnished with an outer glass cylinder resting upon a solid plate of glass, through the center of which the tube supplying the gas rose. Thus all the air supplied to the flame was compelled to pass down between the chimney and outer cylinder, becoming thereby strongly heated before it reached the flame, whilst considerable heat was also imparted to the gas before the latter issued from the burner. In this manner a great increase of light, with the same consumption of gas, was obtained

The following table was exhibited, showing the effect of this hot air gas-burner in reducing the consumption of gas for a given amount of light, and thereby also the impurities and heat which are thrown into the atmosphere in which such a lamp is burned:

| | Rate of consumption per hour. | Illuminating power. |
|---|---|---|
| Argand burner supplied with cold air, | 3·3 cubic feet, | 13 Sperm candles |
| | 3·7 " | 15·5 " |
| | 4.2 " | 17 " |
| | 2 2 " | 13 " |
| | 2·6 " | 15 " |
| Same burner supplied with hot air, | 2·7 " | 16·7 " |
| | 3·0 " | 19·7 " |
| | 3·3 " | 21·7 " |

For an equal amount of light, the saving of gas—33 per cent. For an equal consumption of gas, the gain in light—62 per cent.

The temperature necessary to render substances incandescent may be imparted to them in various ways. It may be given directly by mechanical power, as in the "steel mill," formerly used in coal mines. Usualy, however, chemical action is employed, as in gas, candle, and oil flames; or electricity is used, as in various forms of electric light.

The conditions necessary for a good and satisfactory artificial light were now examined. In the first place, the light should contain all colors; that is, it should be capable of showing every variety of tint which will be exposed to it. This is the case with the carbon electric light, and that candle, oil, and gas flames, since the light from these sources contains all the colors of the spectrum. But there are many colors which the mercurial electric light is incapable of showing, since they are absent from its spectrum. It was also shown that all pure colors, except yellow, were perfectly black, when seen by the light of incandescent sodium vapor.

Solar light, although in so many respects superior to artificial light, is defective as regards the showing of colors. There are certain colors which cannot be seen by solar light—for instance, all the color which can be seen by the sodium flame is quite invisible in daylight. If a pigment could be made of such a yellow color as to be of exactly the shade of that produced by the sodium flame it would be absolutely black in solar light. But our pigments are all mixed colors, and no such pigment which thus entirely disappears in the light of sun is known. But in addition to this tint of the sodium flame, there are hundreds of other tints which are also not present in the solar spectrum, and which are consequently invisible in daylight.

Although solar light is inferior to artificial light in the completeness of its colors, yet, in another respect—in the comparatively small amount of heat which accompanies its rays in proportion to the light itself—it is greatly superior to every sort of artificial light. The great amount of heat in our artifiaial lights is absolutely useless. It is nearly all intercepted by the humors of the eye before it reaches the retina, and, no doubt, produces that irksomeness which is felt after working in artificial light for any considerable time and which is not experienced from daylight.

The history of artificial illumination cannot fail to impress upon us the difficulties in the way of the application of scientific discovery to the utilities of life. How long was it after the discovery of the production of gas from coal, before a manufacturer could be found to bring it into actual operation? Thirty years ago working in his laboratory at Blansko, Reichenbach showed us the process by which we could obtain paraffin and paraffin oil from bituminous coal; but the discovery remained unheeded for twenty years. More than thirty years ago, Mr. Faraday pointed out a source of the electric light in the permanent magnet; but we are only now beginning to use it for illuminating purposes. The brilliant little spark was long looked upon as a mere scientific curiosity, and is only now beginning to flash across the sea, guiding the mariner safely into harbor, or warning him from approaching a dangerous coast. How long will thermo-electricity have to wait before it receives a similar application? In thermo-electricity we have a direct transformation of the force of heat which we obtain with such great economy from coal, into an electric current, and this, by further education and development, might be rendered available in the production of the electric light. Hitherto, its application in this direction has been altogether unheeded, and yet of all sources of the power necessary for the electric light, thermo-electricity evokes this power most directly from coal. In the magneto-electric light we have the great disadvantage, that the heat of burning coal must be first transformed into mechanical power, which is made to rotate the armatures of magnets, and thus produce the necessary electric current. In this transformation of heat into mechanical power there is no less than nine-tenths of the original force in the coal absolutely lost. Hence the advantage which would result from the direct application of heat to the production of the electric current.

The man of science rejoices in the discovery of truth for its own sake. He gives his results freely to the

world. It is no part of his duty, it is not his function, to apply those truths to the utilities of life. Success in this direction demands quite different powers of mind. Those who possess these powers, ought also to acquire the necessary knowledge which would enable them, with more facility, to seize upon the discoveries of science, and apply them to the wants of every day life. This scientific knowledge is the link which, up to the present time, has so sadly failed in the application ot science to the manufacturing arts. *Proc. Royal Inst., Feb.* 13, 1863.

## GAS CANNEL AND COALS.

Analysis of the comparative value of Gas made from Coals and Cannel, by Dr. Andrew Fife, Professor of Chemistry, King's College, Aberdeen:—

"A ton of English Caking Coal yields, on an average, at Gas-works, 8,000 feet of Gas; and though a larger quantity was given with my apparatus, yet we must take 8,000 as the quantity on a large scale. The value of the Coal is taken as 1.

"The Wigan Cannel yielded 9,500 and 11,500; the the value of the Gas, bulk for bulk, being the same, viz., 1.85 to the former as 1. Now, taking in to account the quantity of Gas afforded, the value of the Coals for yielding light, by the consumption of their Gases, is as 2.23 for the one quantity, and .25 for the other. Taking the average, we state the value of English Cannel Coal as 2.35, or say 2¼ to Newcastle Coal as 1."

We also give the following analysis of the Cannel raised by the Ince Hall Coal and Cannel Company, by John Leigh, M. R. C. I., Consulting Chemist to the Manchester Corporation Gas Works:—

| | |
|---|---|
| Carbonic Oxide and Aqueous Vapour | 1.53 |
| Olefiant Gas and divers Hydro-Carbons | 8.50 |
| Atmospheric Air | 4.32 |
| Nitrogen | 0.19 |
| Hydrogen | 40.30 |
| Light Carburetted Hydrogen | 33.83 |
| Carbonic Acid | 11.35 |
| | 100.02 |
| Quantity of Gas produced | 11673 cubic ft., |
| Specific Gravity of Gas | 5 20 |

Coke produced from 1 ton of Cannel, 13 cwt. 0 qrs, 13 lbs.

This Cannel is used by the chief Gas works of this country, including London, Liverpool, Manchester, and Birmingham; and by the principal foreign Gas-works, both on the continent and in North and South America.

Analysis of the same Company's Gas Coal, made by J. E. Clift, Engineer to the Pagoda Gas-works, Birmingham:—

| | |
|---|---|
| Carbon, from 100 parts | 84.50 |
| Hydrogen, | 5.14 |
| Oxygen, | 2.10 |
| Nitrogen, | 2.20 |
| Sulphur, | .33 |
| Ash, | 4.12 |
| | 98 39 |
| Loss | 1.61 |
| | 100.00 |

Products obtained from one ton of Gas Coal, being the average results obtained from using 300 tons in making gas:—

Gas produced, 10,200 cubic feet; illuminating power—one Argand burner, consuming five feet per hour—thirteen spermaceti candles of six to the pound; specific gravity, 462; atmospheric air being 1.00. Coke produced, 13 cwt. 3 qrs., or 44 imperial bushels; suitable for Ironfounders, Brassfounders, and Maltsters. Ammoniacal Liquor produced, 20 gallons; 1 gallon requiring 10 oz. of the Sulphuric Acid of Commerce to saturate it. Tar produced, 10 gallons.

Purification of the Gas.—1,000 cubic feet of Gas requires 12¼ lbs. of lime for its purification; which shows it to be comparatively very free from Sulphur.

The other impurities of Coal Gas are not more abundant than in that made from other Coals,

Further Analysis of the same Companie's Gas Coal, made by Professor Thompson, of London:—

| | |
|---|---|
| Specific gravity | 1.270 |
| Coke, per cent | 65,2 |
| Volatile matter, per cent | 34,8 |
| Cubic feet of Gas per ton, gross | 11,400 |
| " " " " purified | 11,200 |
| Impurity per cent, in Gas | 1.8 |
| Specific gravity of purified Gas | 406 |
| Illuminating matter condensible by Bromine, per cent | 4.25 |
| Carbonic oxide in purified Gas, per cent | 4. |

Illuminating power of the Gas, burnt at 5 feet per hour, equal to 13.8 spermaceti candles, each consuming 120 grains per hour.

Heating power of the Coal.—1 lb. will convert 15½ lbs. of boiling water into steam.—*Laird's Liverpool Coal Circular.*

## CHAPAPOTE.

*Translated for this Journal from the Journal de l'Eclairage, by* Prof. Henry Wurtz.

M. Chateau, Chemist to the *Museum d'Historie Naturelle*, contributes an interesting article upon the geological position, composition and practical applications of the bituminous chapapote of the Island of Cuba.

1. Historical Notice.

The Island of Cuba seems to be an immense block of bitumen heaved up to the surface of the sea by submarine volcanoes, in some places solid and buried to a small depth in the soil, in other places open to the sky, sometimes soft, so as to take and retain impressions, sometimes liquid and forming pitch lakes like that of Trinidad.

Dumas, in his "Traité de Chimie" 1831, says, "There is imported under the names of 'Mexican Asphalt,' or 'Chapapote,' a solid bitumen which really comes from the environs of Havana, in the island of Cuba, where it is abundant. It is solid, very frangible, of a large and very handsome black fracture, but gives a brown powder; has a very strong, but not disagreeable odor. Here and there it contains fragments of wood or straw. Its density differs little from that of water, certain fragments swimming and others sinking therein. A slight elevation of temperature softens it, and in boiling water it fuses completely, and swims upon the surface as a thick liquid. It is absolutely unattached by either acids or alkalies. Alcohol dissolves a very little of it, and becomes milky on addition of water. Ether and spirits of turpentine take up about half of it, leaving a greenish black residue, which is still fusible but no longer melts in boiling water. The ethereal solution is deep red, and on evaporation leaves a soft transparent bituminous matter, of the same color. Heated in a close vessel, it swells up much during decomposition and leaves 0,10 of a very brilliant and extremely light coke. The oils which distil over are yellow and viscous.

In 1860, M. Bing brought some to France for experiment, and different chemists made analyses of it In 1861, he commenced importing it on a large scale, and from this date, the entrepot of Caillois, at Poissy, near Paris, has been used as a special depot of chapapote.

Geological Position.

The whole island of Cuba, essentially of volcanic origin, abounds in bitumens, liquid, pasty and solid, but these substances are more especially to be sought for—

1. In certain brown limestones, which are sometimes saccharoid and sometimes compact.

2. In brown limestones which contain irregular geodes, with tuberculous surfaces, and colored either on their exteriors or their fractured surfaces, brown, gray and reddish.

3. In and about certain rocks which are brilliantly crystallized and of a bluish or greenish gray color, more particularly those varieties which are much fissured or which give out, when warm, after being struck with a hammer, a characteristic bituminous odor.

4. In the neighborhood of a certain yellowish green tender, fragile, contorted rock, which contains a sort of resinous lignite (called bituminous coal by the author) of which there is a mine at Casualidad.

5. Occasionally in the surface sands, in the form of blackish kidney shaped masses, which must be regarded as indications of its existence, in mass, in the surrounding rocks.

6. In the schists of the coal formation.

Chemical Composition of Different Qualities.

First Quality, Compact variety with glossy fracture, not plastic, brownish black in color, like black liquorice, but giving a chocolate colored powder. It has much resemblance to dry pitch made from coal tar, but differs in odor and has a less brilliant fracture. Its density is 1.44. It does not fuse or even soften in boiling water, becoming pasty first at 248° F. and liquefying between 340° and 360° F. Distilled in a close vessel, this compact variety gave 54.30 p. c. of volatile and gaseous matters and 45.70 p. c. of fixed residue (coke), the volatile portion consisting of 40.50 of liquids, highly fetid, highly colored and lighter than water, with 13 80 of a very sulphuretted gas.

The crude liquid products, submitted to frational distillation, give, for 100 parts, 45 to 50 parts of oil similar to oil of schist, containing a little naphtha and benzole, 3 34 of a milky water charged with sulphuretted products and a thick oily residue which contains 4 or 5 p. c. of paraffine.

The gaseous products are composed of different hydrocarbons, with sulphohydrate of ammonia in very large quantity, and burn with a very brilliant and somewhat smoky flame.

The coke is hard and compact, composed of pure carbon 88.57 and mineral matter or ash 11.43 per 100. The ashes are chiefly silicate of alumina and oxyd of iron.

Subjected to the action of benzole, this compact chapapote gives 73.26 per 100 of soluble bitumen. The insoluble portion is of a dirty gray, and clayey in character.

2, Second Quality. Earthy Variety. Has an earthy granular fracture, conchoidal in places, is plastic when struck, and when pressed between the fingers, and is not homogeneous in texture. Its color is brownish black like that of the first quality, but it gives a powder of a much darker color. Its density is 1.54. It becomes pasty only at 300° F. and liquefies between 360° and 375° F.

Distilled in a close vessel it gives 35 p. c. of liquids, 16.3 of solids and 48.7 of coke.

The crude liquid products are highly colored, of a strong, fetid sulphurous odor, and lighter than water. Their composition is similar to that of those from the first quality. The gaseous products are also like those from the first quality. The coke is hard and compact, containing 91.71 p. c. of carbon and a more silicious ash than before.

Benzole dissolves 65,61 p. c., leaving a blackish, sandy, granular residue.

3. Bitumen of Santa-Rosa (Island of Cuba.) This bitumen is solid, compact, with a clean, brilliant fracture, in places largely conchoidal. The fresh fracture has as black a color as that of the first quality of chapapote. Its density is but 1.25. It softens in boiling water and fuses about 250° or 260° F. Benzole dissolves 70 p. c. When distilled it gives 29 p. c. of liquid, 24.43 of gaseous and, 46.57 of coke products. The coke is compact and contains 88 p. c. of carbon. The crude liquid products are chiefly similar to oil of schist, and the quantity of water obtained in the distillation amounts to about ten per cent of the weight of bitumen.

This variety differs from the preceeding chapapotes, as will be observed—1. in giving less liquid products of distillation, 2. in its smaller specific gravity, and 3. in its lower point of fusion.

4. Liquid Bitumen—(Petroleum?) This bitumen is pasty, adheres strongly to the fingers, and has the aspect of coal tar, becomes fluid upon boiling water, has a density of 1.33, and is entirely soluble in benzole. Liquefied, and projected upon cold water, it floats. Distilled, it gives 67.18 liquids, 12.38 gases and 20.44 coke. During the distillation, it first liquefies, then swells up, at which moment clear water passes over in small quantity. The mass then sinks down and boils tranquilly, a little more milky and very sulphurous water

passing. Oil of an amber color then distils over. Finally there passes over a thick ropy oil, of an orange yellow color (ruby-red by reflected light) which solidifies in the neck of the retort and in the recipient. This thick portion contains paraffine, and 80 or 85 per cent. of the crude liquid consists of oil resembling oil of schist. The coke is very light and porous, and contains 91.56 of carbon and 8.44 of ashes, which latter are reddish, ferruginous, and similar to those before described. The author says that no bitumen of this species exists in France or in Europe, and that it resembles the pasty bitumens of Asia and of Canada. In other words it is a variety of thick petroleum.

APPLICATIONS OF THE CUBAN BITUMENS

Directly, for making bituminous mastics for pavements of all kinds; for lining cisterns and basins for holding water and acids; in the fabrication of mosaics; for protecting walls from humidity; preservation of wood from wet, such as rail road ties, wood placed in sea water etc., preservation of iron and other metals from rust; for roofs; in the manufactury of artificial fuels; preservation of telegraph wires; for varnishes, when dissolved in benzole and other media, for wood and metals etc. etc.

Indirectly, in the form of products obtained from them by distillation—for illuminating purposes; for extraction of paraffine; for making oils for lubrication, etc. etc.

## SCIENTIFIC INTELLIGENCE,

*Prepared for this Journal by Prof'r.* HENRY WURTZ.

MIGRATIONS OF PHOSPHORUS.

The following interesting remarks are made by Dr. Hofmann in his elaborate Report on the Great Exhibition of 1862—"Large masses of phosphorus are, in the course of geological revolutions, extending over vast periods of time, restored from the organic realm of nature to the mineral kingdom by the slow process of fossilization; whereby vegetable tissues are gradually transformed into peat, lignite and coal; and animal tissues are petrified into coprolites, which in course of time yields crystalline apatite. After lying locked up and motionless in these forms for indefinite periods, phosphorus by further geological movements, becomes again exposed to the action of its natural solvents, water and carbonic acid, and is thus restored to active service in the organisms of plants and lower animals, through which it passes to complete the mighty cycle of its movements into the blood and tissues of the human frame.

While circulating thus, age after age through the three kingdoms of nature, phosphorus is never for a moment free. It is throughout retained in combination with oxygen, and with the earthy or alkaline metals, for which its attraction is intense."

ARTIFICIAL IVORY TABLETS FOR PHOTOGRAPHY.

Finely pulverized heavy spar (sulphate of baryta) is mixed with gelatine or albumen, compressed into sheets, dried and polished.—*Crace Calvert.*

COLORING MATTER OF THE EMERALD.

Lewy stated in 1858 that this color is organic and destroyed by heat, but at the session of the Academy of Sciences of June 27, 1864, Woehler & G. Rose communicated new experiments, stating that they kept the emerald at the temperature of melted copper for an hour, rendering it opaque, but not affecting the color. They recur therefore to the old belief that this color is due to chromic oxyd, and deem this the true view.

NEW RESEARCHES ON COAL TAR.

At the session of July 6, 1864, Bechamp communicated to the Academy of Sciences some new results obtained with coal tar. He finds that by treatment with bichlorid of tin, the bases are separated from the tar, and a larger quantity of benzole can then be distilled. He has discovered a new hydrocarbon liquid in the tar, which boils at about 280° F.

IMPORTANT PRACTICAL APPLICATION OF THE SPECTROSCOPE.

The English spectroscopist Roscoe has applied this new instrument of research to the manufacture of steel by the Bessemer process. One of the greatest drawbacks to the successful practical working of Bessemer's process for converting cast iron directly into steel has been the difficulty of determining the exact point at which the blast of air passing through the molten metal is to be stopped. The conversion of five tons of cast iron into cast steel usually occupies from fifteen to twenty minutes, according to the varying conditions of weather, quality of the iron, strength of the blast, etc. If the blast be continued for ten seconds after the proper point has been attained, or if it be discontinued ten seconds before that point is reached, the charge becomes either so viscid that it cannot be poured from the converting vessel into the moulds, or it contains so much carbon as to crumble under the hammer. Up to the present time, the manufacturer has judged of the condition of the metal by the general appearance of the flame which issues from the mouth of the converting vessel. Long experience enables the workman to detect, with more or less exactitude, the point at which the blast must be cut off. It appeared to Professor Roscoe that an examination of the spectrum of this flame might render it possible to determine this point with scientific accuracy, and that thus an insight might be gained into the somewhat complicated chemical changes which occur in this mode of conversion of cast iron into steel. At the request of Messrs John Brown & Co, of the Atlas Works, Sheffield, Professor Roscoe investigated the subject, and succeeded in obtaining very satisfactory and interesting results. The instrument employed was an ordinary Steinheil's spectroscope, furnished with photographic scale and lamp, and provided with a convenient arrangement for directing the tube carrying the slit towards any wished-for part of the flame, and for clamping the whole instrument in the required position. By help of such an arrangement the spectrum of the flame can be most readily observed, and the changes which periodically occur can be most accurately noted.

The light which is given off by the flame in this process is most intense; indeed a more magnificent example of combustion in oxygen cannot be imagined—and a cursory examination of the flame spectrum in its various phases reveals complicated masses of dark absorption bands and bright lines, showing that a variety of substances are present in the flame in the state of incandescent gas. By a simultaneous comparison of these lines in the flame spectrum with the well known spectra of certain elementary bodies, Roscoe succeeded in detecting the presence of the following substances in the Bessemer flame—sodium, potassium, lithium, iron, carbon, phosphorus, hydrogen and nitrogen—a list to which further investigation with an instrument of higher dispersive and magnifying powers than that employed, would doubtless add other members. The investigation has already advanced so far that the point in the condition of the metal at which it has been found necessary to stop the blast can be ascertained with precision; and thus, by the application of Spectrum Analysis, that which previously depended on the quickness of vision of a skilled eye has become a matter of exact scientific observation.—*Abstract from the Practical Mechanics Journal.*

THE MINES OF EL DORADO COUNTY.—The Placerville News has the following good words for the El Dorado county mines:

"We note the fact with pleasure that a large number of the mines in our vicinity are being developed with an energy that is not to be found anywhere but in our own California. One year ago there were but two or three mines in the entire country that were used for the purpose of crushing the gold-bearing rock which is now known to exist in immense quantities in all the surrounding hills. To-day we can count twenty steam quartz mills in this country that are in operation or being constructed. And in no instance, with proper working have they failed to reward their owners richly."

Rather wink at small injuries than to be too forward to avenge them. Throw down a bee-hive, and, instead of one enemy, you make a thousand.

The drains of Paris are declared to be the most wonderful work of the kind ever executed. Hundreds of hollow tubes, each one a marvel of solidity and skill, run from every quarter of the town to one immense receptacle of the filth and waste water thus carried off. Before the mouth of this hideous reservoir is placed a grating, through which the mass of infection pours night and day. This grating is meant to prevent the passage of any object beyond a certain size which might otherwise obstruct the tube.

These sewers are built in a style of magnificence which might be expected from a body who were not limited as to expense. The large intercepting sewers are made with footways on each side. Those along the Rue Rivoli and the Boulevard Sebastopol are so large that a full-sized man can walk on the footway with his hat on. They are kept in a state of cleanliness that is surprising. The steps that lead down to them are wide enough for two persons to descend side by side. A railway runs along the edge of each of the footways of the large sewers, and below is the invert forming the sewer proper. An exceedingly well devised apparatus travels up and down this railway, and mechanical scrapers keep the bottom of the sewer constantly cleansed

MANUFACTURES.—The rapid increase of the manufactures of the United States, has no parallel in history. During the decade which closed with 1860, this department of national wealth outstriped all others—and since that time, the progress has been in an increased ratio. From 1850 to 1860, the increase was eighty-six per cent; the value of the manufactured articles being at the last census $1,900,000,000. The product of the last four years will, in all probability, exceed that of the previous ten years. The demands growing out of the increase of population, and the necessities of the war, have taxed all branches of manufactures in the United States to their utmost capacity. Throughout the New England and Middle States, factories are springing up to meet the increased demand. We are told that these States are now reaping a rich return for their labor. The inventive genius of the Yankee nation is constantly bringing out new, or improving upon the old methods of the manufacturing world, and soon, we doubt not, the manufacturers of the United States will be able to compete with those of France and England.

GOLD IN ANCIENT TIMES.—Whatever may have been the source whence the ancients obtained their gold, there is evidence that this metal was admired and valued by them as much as it is at present. Many of the accounts given by early writers dazzle us into the supposition that the stores of gold in those days were much larger than can be commanded at present. Thus Semiramis is said to have erected statues of Jupiter, Juno, and Rhea, forty feet in height, and made of beaten gold. Drinking vessels made of gold, and weighing twelve hundred talents, are also spoken of. The sumptuous display of precious metals in the palaces of the great are frequently alluded to; but it has been aptly observed that the quantity diffused among the bulk of the English population at the present would make a sum total far outbidding the golden wreath of those earlier days, though less obvious and glittering from being so much more diffused.

PUMPING TO NO PURPOSE.—"Suppose," said an examiner to a competitive in engineering, "you had built an engine yourself, performed every part of the work without assistance, and knew that it was in complete order, but when put into a vessel the pump would not draw water, what would you do?" "I would go to the side of the vessel and ascertain if there was any water to draw," replied the competitive. So smart a fellow, one would think, would first ascertain if there were "any water to draw" before he set his pump agoing; but we must remember that the examiner was pumping him, not he the examiner.

An American pint holds 7,000 grains of water.

THE AMERICAN GAS-LIGHT JOURNAL AND MINING REPORTER is published on the 2d and 16th of every month, and is a recognized official organ of—

LIGHT, HEAT, MINING INTERESTS.

PETROLEUM, WATER-SUPPLY, AND SCIENTIFIC SUBJECTS GENERALLY.

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JAMES W. BRYANT, . . . . . EDITOR.

FRIDAY, SEPT. 3d, 1864.

BACK NUMBERS WANTED.—We want to complete our files of the Journal, the following numbers, for which we are willing to pay full price.

Vol. II—No.'s 13, 22, 24, 25, 29 and 34.
Vol. III—No.'s 40, 42, 44, 47, 48, 52 and 56.
Vol. IV—No.'s 63, 64, 67, 68, 69, 70, 72, 74, 80, 82, 83.
Vol. V.—No.'s 91, 93, 95 and 96.

Those of our subscribers who do not bind the Journal, would do us an especial favor by forwarding to us any of the above numbers. We are being constantly called upon to furnish back issues of our paper by those who value it for future reference, and we have supplied them until all of the above numbers are exhausted.

☞ In consequence of the illness of the Editor for the last two weeks, we are compelled to go to press without our usual supply of editorial matter.

THE ART OF SAW FILING, Scientifically treated and explained on Philosophical principles, with full and explicit directions for putting in order all kinds of saws, from a Jeweller's saw to a steam saw mill. Illustrated by 44 engravings, by H. W. Holly—Published by John Wiley, 535 Broadway, New York.

This is a very handsome and neatly gotten up little volume of 56 pages, bound in muslin, and will be of great value to all those who find it necessary to use a saw, no matter how minute or extended in its dimensions.

THE CARPENTER'S AND JOINER'S HAND-BOOK, containing a complete treatise on framing Hip and Valley Roofs, together with much valuable instruction for all mechanics and amateurs, useful rules, tables, &c., never before published,— by H. W. Holly, practical Architect and Builder—Illustrated by 37 engravings.—Published by John Wiley, 535 Broadway, New York.

The author, in his preface, says: "This work has been undertaken to supply a want long felt by the trade: that is a cheap and convenient 'Pocket Guide,' containing the most useful and necessary rules for the Carpenter." Judging from a slight perusal of the book we should say he had succeeded in getting up a volume which is calculated to be of great practical benefit to the Carpenter. It is convenient in size, and is in all respects a very valuable Hand-Book.

## THE ORE AT MINE LA MOTTE, MISSOURI.

Dr. Genth, of Philadelphia, a number of years ago, (see Am. Jour. of Science, May, 1857, p. 419,) discovered that the ore of the celebrated cobalt and nickel locality in Missouri, was a sulphuret of nickel and cobalt (without arsenic,) identical with the mineral found near Siegen, in Prussia and called siegenite. Genth's analysis gave 30·53 p. c. of nickel and 21·34 of cobalt in the pure mineral. At that time, however, our method of separating nickel and cobalt from each other in analysis were exceedingly imperfect and unreliable. Professor Brush, of New Haven, who occupies the first rank among living mineralogists and mineral analysts, has recently reanalyzed the Prussian siegenite, using recent highly improved methods of separating the nickel and cobalt, and finds but 14·6 p. c. of the former and 40·77 p. c. of the latter metal, results greatly differing from those of all former analysts. The Mine la Motte ore, therefore, requires a new examination. Most of the ore from Mine la Motte which has been worked for nickel and cobalt is a gozzan, or product of oxydation of the siegenite, obtained from surface workings.

The writer found, in 1857, extending throughout a considerable range in Gaston county and adjoining counties in North Carolina, outcrops marked by gozzans similar to those of Mine la Motte, containing nickel and cobalt, with sulphur and no arsenic, which he believes to indicate the presence of very much of this valuable ore, siegenite, in the mineral veins of that rich, but little known district. (See my article in Am. Jour. of Science, Jan. 1859, pp. 26—30. H. W.)

## EFFECT OF TEMPERATURE ON THE VOLUMES OF BODIES.

Dilatation by the action of heat is so familiar a phenomenon, that many of the most eminent scientists have been, and some probably still are, deluded into regarding heat as the agent which produces repulsion between the atoms; as the principle of repulsion, so to express it. Current developements of science, however, are fast overthrowing this hypothesis. Within certain limits of temperature, in fact it is now recognized that a vast number of bodies, including the great typical compound, water, while in the liquid form, contract on application of additional heat; the more intense vibrations, incomprehensible as it seems, taking place within a smaller space. I am led to make these remarks by some recent observations of Phipson, who has found contraction produced by heat in the case of some solid bodies, among which he mentions gadolinite, zircons and yellow obsidians. It would appear, from these facts, that our former belief of the universality of expansion by the effect of heat must be narrowed down exclusively to the case of bodies in the gaseous state. We know not, though, but what these also, at temperatures lower or higher than those within which we are as yet able to make accurate observations, may not also depart from the supposed law. A salient class of phenomena may be cited, which to my mind furnishes remarkable examples of the production by heat, in conjunction with another force, or form of force, of actual condensation of gaseous bodies, even to the extent of solidification. This is the case of the decomposition of the carbonic acid and amonia of the air by the conjoined thermic and activic rays of the sun, during vegetable growth. Some would here bring in another force under the name of vitality, the existence of which will not be denied, but upon which I look, not as a force, capable itself of doing work and transforming matter, but merely as a directing influence, one of those inscrutable laws which direct and govern the forces of nature; in other words, I would compare vitality to the engine driver of a locomotive, without whom the machine cannot move, while he himself, though powerless to move the machine, can cause it to move under the impulse of the heat of its furnace, backward or forward, fast or slow.—H. W.

WHERE THE CONFEDERATES GET THEIR COAL.—There are extensive coal mines lying on both sides of the James River, a few miles above Richmond. The area of this coal field is about 20 miles from north to south, with an average breadth of five miles. The coal is bituminous, and it has been largely used for steam purposes and for the production of gas. These mines were probably the earliest worked of any in the United States, mention being made of them in the American Journal of Science of 1818, as having been in operation for 30 years previously. The works, as now carried on, are at a greater depth than have ever been reached at any other mines in this country—the deepest shaft sunk being about 800 ft. Anthracite coal mines have been opened within a few years in Montgomery, Pulaski, and Wythe counties, and also along the range of mountains in the western part of Augusta county. In Brush Mountain, along the north-western line of Montgomery country, and in Price's Mountain, six or seven miles south-east of this, some very good coal is mined—that from the former locality being free-burning, semi bituminous, and that of the latter a very pure anthracite. These mines are in close proximity to the Virginia and Tennessee Railroad, which is only a mile and a half distant. The amount of coal mined in the State of Virginia during the year of 1860 was 382,000 tons, valued at about $700,000 at the mines. There are extensive beds of bituminous and semi-bituminous coal in North Carolina, in Chatham and Moore counties on Deep River. There are also extensive beds of semi-bituminous coal in Rockingham and Stokes counties, on the Dan River; but previous to the rebellion there had been no great amount mined there. The only mines of importance in Southern Tennessee are on the Sewanee River, at the north end of a branch railroad 16 miles long, which leaves the Nashville and Chattanooga Railroad at the tunnel where it crosses the mountains.—*American Coal Trade Review.*

GOLD FROM AUSTRALIAN COLONIES AND NEW ZEALAND.—A return has been issued of the quantity and value of gold exported from the Australian colonies, including New Zealand, during the years 1858 to 1862, both inclusive; distinguishing each year what was exported from New Zealand, via Victoria or any other of the Australian colonies or ports; and of the quantity and value of gold exported from New Zealand to Great Britain during said years; distinguishing what was exported by the province of Otago and each of the other provinces in New Zealand, either direct to Great Britian, or other colony or port in Australia. The following is the return from New South Wales and Victoria—1858, 51,999l. 18s.; 1859, 81,504l.; 1860, 115,290l.; 1861, 191, 234l.; 1862, 142,949l. 10s. Victoria—1853. 2,555, 261 ozs.; 1859, 2,280,525 ozs. 14 dwts.; 1860, 2, 128,466 ozs. 11 dwts; 1861, 1,978,864 ozs. 13 dwts; 1862, 1882,448 ozs. 18 dwts., value 6,649,624l. The returns received from the colony for the years 1858, 1859, 1860, and 1861, do not give the value of the gold. The total exported from New Zealand from the 1st April, 1857, to the 30th September, 1863, is as follows—Auckland, 5832 ozs., value 18,601l.; Nelson, 59,080 ozs., 228,933l.; Otago, 1,065,851 ozs., 4,130,174l.; total from New Zealand, 1,130, 763 ozs., value 4,377,708l.

IDAHO is an Indian word signifying "The Gem of the Mountains." It was carved out of large portions of three other territories, viz: Washington, Dakota and Nebraska.

DISCOVERY OF ROMAN REMAINS AT CHEDWORTH.—About two years ago, Thomas Margetts, a gamekeeper on the estate of Lord Eldon, at Chedworth, noticed in a rabbit-warren a small portion of Roman pavement, but at the time did not consider it of sufficient moment to call attention to it. A few days ago, however, he observed that the soil had been still further removed by the rabbits, and that a large portion of the pavement was exposed to view. He communicated the facts to Mr. Farr, one of his lordship's trustees, who immediately ordered excavations to be made, which have resulted in the discovery of three distinct rooms, the floors of which are in a beautiful state of preservation. One of the rooms measures 36 feet long by 19½ feet wide, and the design of the pavement consists of a vase and flowers, surrounded by a border. The representation of a man holding in his hand a hare or leveret is clearly brought out In another room, not quite so large as the first, is the figure of a youth holding in one hand a bird, and the other a buck's horn; while in the third room a font has been discovered, which leads to the presumption that the building has been used by the Romans as a place of worship. The workmen are still actively engaged.

CHANGES OF A PIECE OF SILVER.—If we place a piece of silver in nitric acid, and add a proper quantity of water, the silver is dissolved as completely as sugar is in water, and wholly disappears, the solution looking exactly like pure water.

If we now evaporate a portion of the water, and set the solution away, we find in the course of a few hours that the bottom of the vessel is covered with beautiful white flakes, which are crystals of nitrate of silver, the metallic silver in combination with nitric acid. Nitrate of silver has some peculia properties. If kept free from contact with other substances, it may be exposed to the light for any length of time without any change from its pure white color. It may be applied to cotton or the skin, or hair, in the dark without any change in color, but if it is applied moist to any vegetable or animal substance and exposed to the light it turns black in a few minutes. It is the coloring agent in indelible ink.

If we place crystal or nitrate of silver in water, they are quickly dissolved; and if we throw a little table salt—the chloride of sodium—into the solution, the silver leaves the nitric acid and combines with the chloride in the salt, forming the chloride of silver. This is a white, lusterless powder, and gradually turns black when exposed to the action of the light. Metals may be silvered cold by means of the chloride of silver.

If we mix chloride of silver with carbonate of soda, and heat the mixture in a crucible to a very bright red, it is dissolved, and both of the substances are decomposed. The chloride leaves the silver and combines with the sodium of the soda, forming chloride of sodium—table salt—the carbonic acid escapes as a gas, and the silver is left in a metallic state in the bottom of the crucible.

Thus we have silver first as a white solid metal, then a liquid, like water, then in crystals like salt, then as indelible ink, then as a grey or black powder, and finally as a metal. And these are only a very small part of the forms which it may be made to assume.

PETROLEUM.—The quantity of petroleum imported into Great Britian, during the first six months of this year exhibits a considerable decrease as compared with the corresponding period of 1863. Thus, in the first six months of 1864, 5652 tuns were imported, against 21,061 tuns in the first half of 1863. In June the imports were only 883 tuns, against 5391 tuns in June, 1863, and 2614 tuns in June, 1862. The decrease discernable in this year's imports is attributable to the diminshed supplies from the United States, only 4398 tuns having been received from that quarter this year, against 20,066 tuns in the corresponding period of 1863. The value of the petroleum imported in the first five months of 1854 was 100,051*l.*, against 164,528*l.* in the corresponding period of 1863, and 97,185*l.* in the corresponding period of 1862.

## PETROLEUM REVIEW—SEPTEMBER 3d.

NEW YORK, Sept. 3, 1864.

*Crude.* The market has been dull, although it is in better demand for export than bonded, and closes at 50 cts. The fluctuations for the past few days have given all descriptions of oils a downward tendency. I notice sales of 500 Bbls 40° *a* 47° gravity at 52 cts—also sales 119 bbls 40° *a* 47° at 51 cts—and at the close it is freely offered at 50 cts.

*Refined.* Has been dull, particularly, for free oil. Prices may be quoted nominal at 80 to 82½ cts for bonded and 85 to 90 cts for free.

*Benzole.* Dull at 50 *a* 55 cts.

*Remarks.* The market has been dull, the export demand falling off in consequence of the European market being now well stocked. Oil has not fallen with Gold as much as might have been expected. One reason for this is that in consequence of a "block up" on one of our largest Rail Roads, our arrivals have been much lighter than usual. The arrivals are by the Erie Railway 20,201 bbls by the Camden & Amboy R. R. 938 bbls. Total 21,139 bbls.

B. L. HARSELL,
Commission Merchant,
132 & 134 Maiden Lane, N. Y.

GOOD ADVICE.—If the body is tired, rest; if the brain is tired sleep If the bowels are loose, lie down in a warm bed and remain there, and eat nothing until you are well. If an action of the bowels does not occur at the usual hour, eat not an atom till they do act, at least for thirty-six hours; meanwhile drink largely of cold water or hot teas, exercise in the open air to the extent of a gentle perspiration, and keep this up until things are righted: this one suggestion, if practiced, would save myriads of lives every year, both in the city and country. The best medicines in the world are warmth, abstinence and repose.—JOURNAL OF HEALTH.

OIL ON THE CLARION.—The Banner says: It is a fixed fact that there is a good show of oil on the Clarion river; and we learn with pleasure that a company has been formed for the purpose of boring for it at Blyson's run. Wells are to be sunk on both sides of the river to the depth of six-hundred feet, and contracts for the work have already been made.

VELOCITY OF NERVOUS FORCE.—By means of the chronoscope (veterinrian) M Hirsh has come to the conclusion that nerves transmit their impressions at the rate of 34 metres per second. This is in a man, while M. Heinholtz estimates that in the motor nerves of the frog it is at the velocity of 190 feet per pound.

Among some discoveries recently made at Pompeii, one of the most curious is a well in which excellent water exists. Up to the moment of making this discovery, no well had ever been met with at Pompeii containing water. M. de Luca has undertaken its analysis.

TO PREVENT HYDROPHOBIA.—Take immediately, warm vinegar or tepid water, wash the wound clean therewith, and then dry it; pour then upon the wound a few drops of muriatic acid. Mineral acids destroy the poison of the saliva, by which means the effect of the latter is neutralized.

ANOTHER REMEDY.—A dog-keeper in England who was bitten eight time by rabid dogs each time averted the horrors of hydrophobia by allowing the common nitrate of silver to filter the wound, which decomposed the saliva, and thus destroyed the virus. A London physician adopts and indorses the remedy.

In the neighborhood of the Caspian Sea, petroleum is used as fuel by impregnating clay with the combustible fluid. The Norwegians mix tar and sawdust, molded in the form of bricks, and burn in a similar manner.

## NEW YORK MINING EXCHANGE.

NEW YORK, Sept. 3d, 1864.

| | Bid. | Asked | | Bid. | Asked |
|---|---|---|---|---|---|
| ***Copper Stocks.*** | | | ***Gold Stocks.*** | | |
| Aztec | 7⅛ | 9 | Benton | 1 | 1¾ |
| Bedford | 1 | 1⅛ | Consol'd Gregory | 25 | 25⅞ |
| Boston | 4⅛ | 5⅜ | Corydon | — | 3 |
| Caledonia, A. P. | 10 | 12 | Gunnel | 3⅜ | 4⅜ |
| Canada | 3½ | 4 | Great Western | — | 8 |
| Carp Lake | 3 | 5 | Hope | — | 9 |
| Central | 65 | 70 | Isaac's Harbor | ¾ | ⅞ |
| Columbian | — | 24 | Manhattan | — | 9 |
| Copper Falls | 34⅛ | 38 | Mariposa | 44 | 44¾ |
| Clifton | — | $1 | Montana | ⅜ | 1 |
| Dacotah | — | 5⅛ | New York | 2⅛ | 3 |
| Derby | ⅞ | 1⅛ | N. Y. & Nova Scotia | ⅝ | 1¾ |
| Douglass | — | — | Quartz Hill | 9¼ | 10 |
| Evergreen | 18¾ | 20 | Quicksilver M'g Co | 81 | 82 |
| Flint Steel River | 12 | 13⅜ | Rocky Mountain | — | 10⅜ |
| Frue | 2¾ | 5 | Smith & Parmelee | 7 | 12 |
| Grand Portage | — | — | ***Coal Stocks.*** | | |
| Hancock | 12¾ | 14 | American | 98 | 100 |
| Hamilton | — | 6 | Ashburton | — | 25 |
| Hilton | 5 | 6 | Central | 62 | 65 |
| Hudson | 1 | 2 | Cumberland | 61 | 62 |
| Huron | 32 | 33 | Del & Hud. Canal | 206 | 208 |
| Indiana | 8¾ | 9¾ | *Hampshire & Balt. | 104 | 110 |
| Isle Royale | 20 | 20⅝ | Pennsylvania | 213 | 215 |
| Keweenaw | — | 6 | ***Lead Stocks.*** | | |
| Knowlton | 7 | 10 | Bucks County | ⅝ | ⅞ |
| Lafayette | 1 | 2 | Clute | 1⅝ | 1⅞ |
| Manhattan | — | — | Erie | — | 20 |
| Mendota | — | — | Macomb | 3¾ | 5 |
| Merrimac | 4¾ | 5⅜ | Plancentia Bay | 1¾ | 1¾ |
| Minnesota | 33 | 37 | Sussex | ¾ | ⅞ |
| New York, A. P. | 2 | 3⅛ | Walkill | 3⅛ | 6 |
| N. J. Consolidated | 4 | 4¾ | ***Iron Stocks.*** | | |
| Norwich | — | 6 | Copake | 8 | 10 |
| Ogima | 5 | 6¾ | French Creek | ⅝ | 1 |
| Ontonagon | 3 | 4 | Teal Lake | 4½ | 6 |
| Penn | — | 11½ | ***Miscellaneous.*** | | |
| Providence | 1¾ | 2 | Rutland Marble | 17 | 20 |
| Quincy | 96⅝ | 98 | * *Ex. div.* | | |
| Reliance | 1¾ | 2¾ | | | |
| Rockland | 12⅜ | 14 | | | |
| Superior | 8⅝ | 9 | | | |
| Sharon Consolidated | — | 3 | | | |

TRUTHFUL.—"A smooth sea never made a skillful mariner;" neither do uninterrupted successes qualify a man for usefulness or happiness. The storms of adversity, like the storms of the sea, arouse the faculties, and incite the invention, prudence, skill and fortitude of the voyager.

SOAP MINE.—A veritable soap-mine has been discovered in Esmeralda, California. The vein is ten feet wide, six hundred feet long, and runs very deep. The soap, when taken from the mine, is as soft as putty, but hardens on exposure to the air.

TO ADVERTISERS.—Our paper offers a superior medium as an advertising agent, to all those who manufacture or sell machinery or appliances of any kind for Gas, Mining, Water, Sewerage, the production or purification of Oils, &c. &c., not so much on account of a wide-spread circulation, as from the fact that it goes directly to the hands of those who are constantly using and requiring machines and improvements for these branches, and who look through our columns for information where to procure them. The class of people who read our paper not only peruse our pages of reading matter, but read the advertisements as well, for the reason that they are directly interested in all things pertaining to their business. We therefore ask, with confidence that we can do them justice, all parties having machinery or improvements of any kind for either of the objects to which our paper is devoted, to send in their advertisements and avail themselves of these advantages. It will be observed that our terms for advertisers are very reasonable.

BRITISH PETROLEUM.—The mineral burning oil issued under this name by Messrs. Thomas & Co. is described as being manufactured from shale. It possesses a very pale straw tint, and slight amount of smell, being altogether free from the offensive odour usually characteristic of shale oils. Its specific gravity is ·812, and its point of temporary ignition is 124° Fahrenheit. It is therefore to be regarded as a well-rectified, safe oil, of good quality. It burns with a clear white flame, and possesses a high illuminating power.

# ROBBINS' PATENT GAS AND WATER JOINT.

THE PROPRIETORS of this unrivalled joint are now prepared to introduce it to general use, and to guarantee that, in all respects, it will fulfil perfectly all the requirements of either water, gas, or steam. It is a joint which remains in all situations absolutely tight.

The following illustrations, with the appended explanations, will give a good idea of the improvement:

Fig. 3.

Fig. 1.

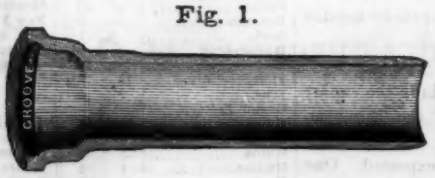


Fig. 2.

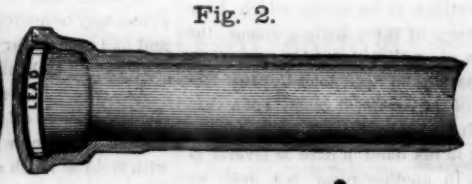



Fig. 4.

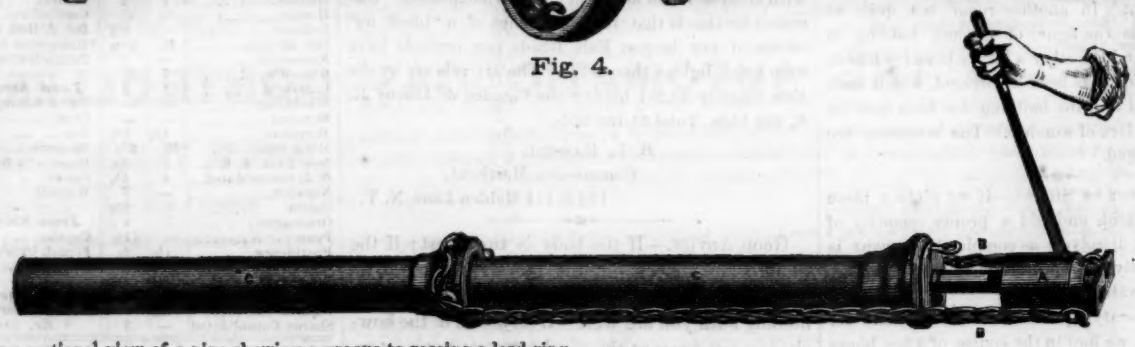



FIG. 1. Is a sectional view of a pipe showing a groove to receive a lead ring.

FIG. 2. Is a sectional view of a pipe showing a lead ring in the groove.

FIG. 3. Represents a former, which is used in the bell end of the pipe while casting the lead ring. Before using the former, however, a strip or belt of India rubber is first inserted in the socket, against which the former rests to prevent the lead escaping from the groove while being cast. Upon the cooling of the lead, the former and rubber ring are withdrawn from the socket, and the lead ring is left projecting inwards from the groove all around, forming an indestructible packing to receive the spigot-end of the pipe.

FIG. 4. Shows two pieces of pipe in connection with an hydraulic jack, by which the spigot-end of the pipe (which is cast tapering and may be cast in a chill), is forced into the lead ring in the groove which perfects the joint. A, represents the jack; B, B, the chains by which the pipes are drawn together; and C, C, pieces of pipe.

This ring joint packing may be cast at the foundry or any convenient place, and when delivered at the ditch, may be laid, and perfect joints formed, by any laborer, above or below the surface, or in ditches filled with water, there being *no joint ditching required*, and it can be laid with very great rapidity.

Among the economies realized by this joint may be enumerated, the saving in the weight of the pipe, in the amount of lead required to be used in forming the packing, in the labor of ditching, and in laying the pipe.

The bell or socket may be cast one-half the usual length, as the width of the groove requires, but from a half to one and a half inches, according to the size of the pipe, thus saving in the total weight about two hundred pounds per ton.

The weight of lead required to form this joint, as compared with the amount of lead used in forming a joint according to the old method, is fully seventy-five per cent. less, only so much being required as to maintain the compensating principle, or enough to allow (upon the raising or depressing of the line of pipe out of a direct line) what is lost upon one side of the ring packing, to take its place upon the other; thus securing flexibility of the joint without affecting its reliability. The use of yarn or hemp packing is dispensed with, the cost of which is an entire saving as compared with the old method of making joints.

The saving of labor in ditching is the total amount usually expended in digging joint-holes, there being *no joints to be caulked.*

The saving in labor in laying pipe furnished with this joint is a sum equal to the whole cost of carrying lead, fuel, ladles to the ditches, casting the lead, bailing out water, and the entire labor of caulking, less only the sum charged for casting the lead ring packing at the foundry, which is comparatively trifling. This last-mentioned economy has been estimated by the best engineers at seventy-five per cent., or the same as the saving in the quantity of lead used.

The cost of pipe cast from our patterns is the same per ton as pipe cast for the old form of joint. The principal iron-founders propose to charge the same price.

We have submitted these joints in water-pipes to a pressure of two hundred and fifty pounds to the square inch, and they have remained perfectly tight. It has also been submitted for months in gas-pipes to the ordinary pressure of our city gas-mains, without any leakage whatever. We are aware that these statements may be deemed by many extravagant, but the merits of the improvement warrant them all, and the most skeptical may be fully convinced by an investigation of its value, and by witnessing the tests to which we submit it, or by its use under any conceivable circumstances.

## TESTIMONIALS.

OFFICE OF THE WATER COMMISSIONERS,
CITY HALL, JERSEY CITY, October 14th, 1863.

Dear Sir,—On the 20th of May last, about two hundred and sixty feet of cast-iron water-pipes, six inches in diameter, with joints constructed according to your invention, were laid for the Jersey City Water-Works, in Prospect street.

The operation of uniting the joints of the pipes, was performed with remarkable facility, and with an important saving in time, materials, and labor. The joints proved perfectly water-tight, after turning the full head of water on the pipes.

In my opinion, your invention has proved entirely successful, and will be found highly beneficial to water companies.

Yours, respectfully,
ROBT. C. BACOT,
*Superintendent and Engineer, Jersey City Water-Works.*

MR. R. C. ROBBINS.

---

ENGINEER'S OFFICE, CROTON AQUEDUCT DEPARTMENT.

Dear Sir,—I have examined your plan for making joints in cast-iron water pipes, and have a report from one of my assistants, of certain experiments made by you, to prove the certainty and economy with which the joints can be made, and their stability when finished.

I think the experiments showed that the joints could be made quite as rapidly, if not more rapidly, than those made in the ordinary method now in use; the quantity of lead used was less than that required in the common joint, and no yarn packing was required. In these respects, your joint seems superior.

After the joints were made, a pressure of three hundred pounds to the square inch, was put upon he pipe in such a manner as to test the efficiency of the joint to prevent both leakage of water, and separation of the pipes from each other longitudinally. This pressure failed to produce either leakage at the joint, or separation, so long as the pipes lay in a direct line; but on deflecting them six and a half inches, in a length of twelve feet, the joint commenced leaking. It is fair to add, that this is a greater deflection than would often be found necessary in laying pipe.

I think the efficiency of the joint in both the points tested in this last experiment, might be increased by increasing the quantity of lead, both in thickness and width.

Altogether, the result of the experiments was such that I have determined to make a more thorough test of your invention by putting down about one thousand feet of pipe, when we commence our operations for the coming season.

The diameter of the pipe subjected to experiment, was six inches, and is the same size that I propose to put down next year.

I am, very respectfully, your obedient servant,
A. W. CRAVEN, Chief Engineer, &c.

To R. C. ROBBINS, Esq., Jersey City.

METROPOLITAN GAS-WORKS,
ENGINEER'S OFFICE, NEW YORK, October 9th, 1863.

Dear Sir,—The undersigned had the pleasure of being present at an experimental test of your patent joint for gas and water pipe, made at the yard of the Croton Aqueduct Department, and cheerfully testify to the results obtained, namely:

First experiment was made with two lengths of eight-inch pipe, jointed together, when a pressure of three hundred pounds to the square inch was applied. This pressure did not force the pipe apart, nor start the joints, but they remained, during this experiment, perfectly tight.

Second experiment was made by deflecting the pipe five inches, which is about equal to eighteen inches in one hundred feet, and the same pressure applied, which caused a small leak at the joints.

Third experiment was made by taking the pipes apar and rejointing them, when the same pressure was applied when lying straight and when deflected; at this experiment there was no leakage.

From these severe tests it is my impression that the superiority of your patent joint has been made manifest, and that it must eventually supersede the old way of jointing pipes together, saving both time and material.

Wishing you success in your enterprise,

I am, very respectfully, yours, &c.,
AMBROSE J. WHITE, Engineer.

To R. C. ROBBINS, Esq.

---

OFFICE OF THE METROPOLITAN GAS-LIGHT COMPANY,
NEW YORK, October 9th, 1863.

Dear Sir,—Having been present at the testing of your patent joint for gas and water pipe, at the yard of the Croton Aqueduct Department, I can testify to the results as stated by Col. A. J. White and fully concur with him in the opinion expressed in his letter to you of this date.

Very respectfully, yours,
W. TITUS, Secretary.

R. C. ROBBINS, Esq.

---

NEW YORK, October 23d, 1863.

Gentlemen.—I am pleased to be able to inform you, that we are fully satisfied that we have done well in adopting your "Improved Joint." in the construction of an aqueduct which we are now building on Oil Creek, Northwestern Pennsylvania.

We have ten miles of three and four inch pipe to lay this season, and, in our estimation, the perfection of the joint, economy in lead, and rapidity with which the pipe can be laid, render it entirely preferable to any other method of laying pipe.

Our Mr. Hutchings advises us that he is putting down the three and four inch pipe at the rate of twenty-five to thirty lengths per hour, with two men in the trench. We are much pleased with this result.

Respectfully yours,
HUTCHINGS & FOSTER.

MESSRS. R. C. ROBBINS & CO.

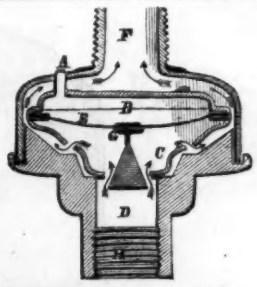
For further information, or for prices and terms, which will be very reasonable, apply to

**R. C. ROBBINS & CO.,**
**No. 218 FULTON STREET NEW YORK**

# THOMPSON'S

**PATENT**

# AUTOMATIC GAS CONTROLLER.




## Notice to Gas Companies and Consumers of Gas generally.

WE RESPECTFULLY INVITE YOUR ATTENTION TO THE FOLLOWING TRUTHFUL DESCRIPTION OF THE construction and operation of this recent and most important invention; its application to every street lamp, and on the fixtures within the works of the Gas Companies, as well as for the use of the general consumer, will be found to effect perfectly and reliably, he object so long sought for, viz: **a perfect control of the Gas under varying pressures, emitting the Gas at the burner without force, and without increase or diminution of quantity, and hence promoting the highest possible illuminating power of the Gas.**

## THE AUTOMATIC GAS CONTROLLER

Is designed to occupy the place of the gas-burner. Within the circumference of a small cylinder, below the burner, is placed a conical valve, attached to a movable diaphragm, the valve and valve seat is proportioned, so that under a supply of Gas, varying in pressure from four-tenths to five inches, the burner will continue to produce the same consumption and development. The unerring accuracy of movement of the Diaphragm at every change of pressure, whether gradual or sudden, and its positive control of the valve which admits, by its proportionate increased or diminished aperture, the same unvarying amount of Gas, has elicited the unqualified approbation of engineers and other experts in the profession.

The simplicity of its construction, and materials used, are a sure guarantee of its durability and continued successful operation. They afford to the consumer of Gas the advantage of a **superior light, with the greatest possible economy**; and for the Gas Company, they control the Street Lamps, affording a more satisfactory light for the public, without waste.

The public are invited to witness its operation, at the Office of the Company; and samples will be sent to Gas Companies for experiment, on application by letter or otherwise.

**G. W. THOMPSON & CO.,**
**Office, 52 GREENE ST., (up stairs.)**
A. L. BOGART, AGENT, 592 BROADWAY,
**New York.**

We are permitted to refer to the following Gentlemen, who have thoroughly examined our Gas Controller:

GEO. H. KITCHEN, Inspector of Gas Meters, 561 Broadway.
CHAS. ROOME, President Manhattan Gas Company.
J. H. ADAM, President New York Gas Company.
PETER COOPER, Cooper Institute.
JOHN A. DUFF, Olympic Theatre.

# THE AMERICAN METER CO.,

*Organized under the General Manufacturing Laws of the State of New York.*

SAMUEL DOWN, PRESIDENT. HENRY CARTWRIGHT, VICE PRESIDENT. RICHARD MERRIFIELD, SECRETARY AND TREASURER.

TRUSTEES.

SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy, and excellence of workmanship. Orders addressed

## AMERICAN METER COMPANY,

512 WEST TWENTY-SECOND STREET, NEW YORK,
ARCH AND TWENTY-SECOND STREETS, PHILADELPHIA,
1 BARRETT STREET, BOSTON, will meet with prompt attention.

### STEAM-PUMPS.

WORTHINGTON'S STEAM PUMPS, extensively used by Gas-Light Companies. For Sale at greatly Reduced Prices.
Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.
Patent GATES, for Water and Steam-stops.
HENRY R. WORTHINGTON,
61 Beekman street, N. Y.

WEST'S IMPROVED PUMPS, the most Simple, Durable, and Powerful, and the Cheapest in use.
J. D. WEST & CO.,
179 BROADWAY, N. Y.

GEO. H. KITCHEN & CO.,
NEW PATENT
**GAS APPARATUS**
**For Country Residences, Public Buildings, &c.,**
FROM $300 UPWARDS.
EVERY DESCRIPTION OF GAS FIXTURES.
**Gas Fitting in all its branches.**
**561 Broadway,**
NEW YORK.

### TO GAS COMPANIES.

THE UNDERSIGNED DESIRES TO undertake the supervision of several small Gas-works, to visit and examine them as often as may be necessary; to obtain and inspect their coal, castings, fire-brick, and other materials; and to manage their general business in such a manner that they shall be under such supervision as is now attainable in large works, at much increased cost. Also, to advise as general Consulting Engineer and expert in practical chemistry.

CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works,
417 Walnut st., Philadelphia.

### To Gas Companies.

A YOUNG MAN, FROM ENGLAND, thoroughly educated, and who has had nine years experience in the Newcastle-under Lyne Gas-Works, England, as an assistant Manager, desires a similar situation in some Gas-Works in the United States. He has credentials of capacity for such a position.

Address, M. C. P. LAWTON,
Office GAS-LIGHT JOURNAL,
15 Nassau street.
112 New York.

### GLYCERIN
FOR
### Filling Wet Gas-Meters,
***Cheaper than Whisky or any other substance.***

We have furnished the Cincinnati Gas and oke Company 300 barrels Glycerin, for filling their wet meters, and are now ready to supply other Gas Companies at the lowest cash prices.
We warrant our Glycerin not to corrode the meter metal, nor to freeze at the lowest ordinary temperature, nor to evaporate.

HARTMAN & LAIST,
Manufacturing Chemists,
*Cincinnati, O.*
Office 64 Sycamore.

NEW YORK FIRE-BRICK and Clay Retort Works. (Branch Works at Kreischerville, Staten Island.)
B. KREISCHER, office 56 Goerck street, corner Delancy street, New York.
GAS RETORTS, TILES and FIRE-BRICK of all shapes and sizes. FIRE MORTAR, CLAY, and SAND. Articles of every description made to order at the shortest notice. B. KREISCHER.

### WOODEN PURIFYING TRAYS.

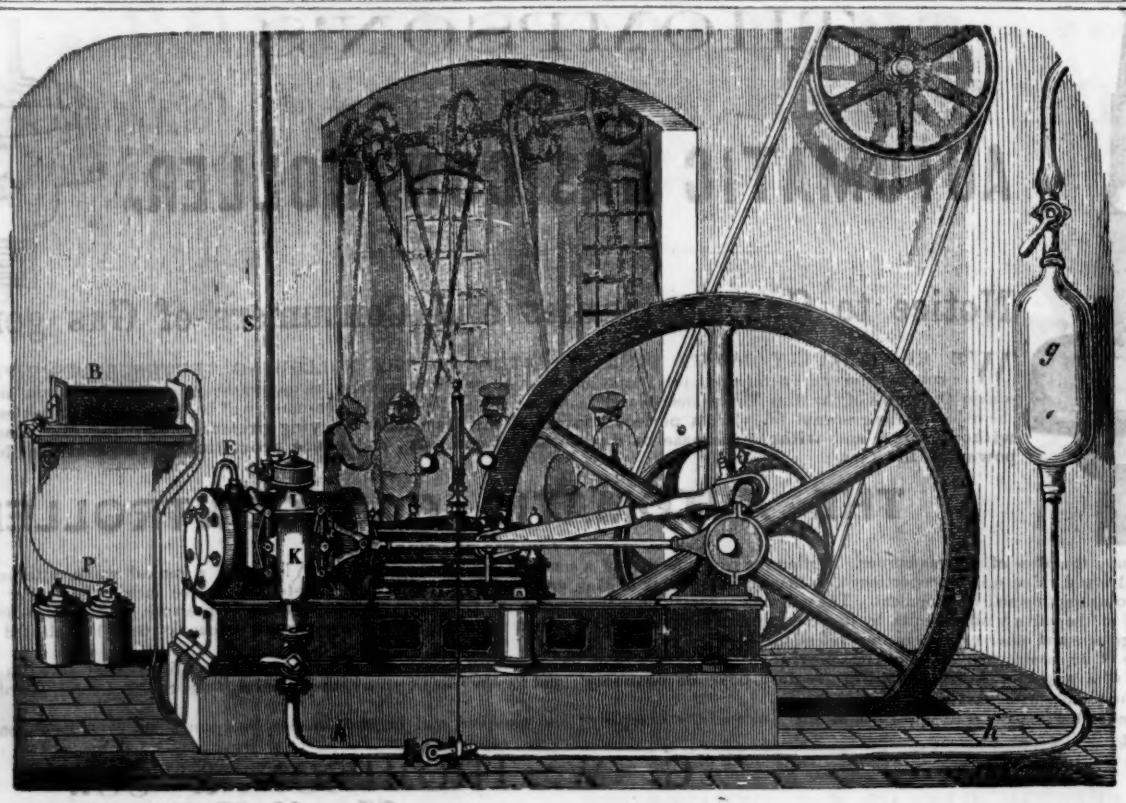
**PATENT**
**Conically Slotted Solid Wood Sieves**
**FOR GAS PURIFIERS.**

## CAUTION
TO
## GAS MANUFACTURERS.

The Conically Slotted Solid Wood Tray was patented 21st October, 1862, by N. O. Hawxhurst, assignee of Wm. Combe, and all persons are cautioned against purchasing such trays of R. G. Hunt, or any other person except the subscriber, as it is a direct infringment of said patent. The following companies are now using these trays.

**Manhattan, New York,**
**Williamsburgh,**
**Brooklyn,**
**Albany,**
**Baltimore,**
**Philadelphia,**
**Chicago,**
**Louisville,**
**And numerous others.**

Orders received by mail or otherwise.
JOHN L. CHEESMAN,
147 Ave. C, New York City.




# MOTEUR—LENOIR.

# LENOIR GAS ENGINE.

This is a horizontal engine, in which a piston, by a connecting rod drives a horizontal shaft.

The gas enters by the pipe "h" from the regulating reservoir "g," (made of vulcanized india rubber,) which regulates the feeding and the branches connected with the gas-pipe.

The tube, K, receives the gas conveyed by the pipe "h," and conducts it to the valve, which opens and closes alternately, by means of a rod moved by an eccentric wheel fastened to the end of the shaft.

Two of Bunsen's piles, P, sufficient to produce the electricity are placed at a little distance from, and in communication with a Ruhmkorff electric apparatus, B. The electric current of this apparatus is conducted by means of insulated wires to the electricity distributor "m," placed on the front of the frame, while the current of electricity and its arrival at the inflammator, inserted at each end of the cylinder, is directed by the movement of the piston-rod, which, by an ingenious combination, impels a small movable slide before the distributor.

The burnt gas, after having performed its functions in the machine, escapes, by means of a valve, through a pipe, S, and the water designed to cool the interior of the cylinder enters through a double passage, by means of a pipe situated near the escape-valve, and goes out by the pipe, E.

A two horse and a half horse Engine are now in practical operation at the brass cock manufactory of Mr. A. Carr, *No.* 135 *Mercer St, between Prince and Houston Streets,* New York where those interested are invited to call and examine them.

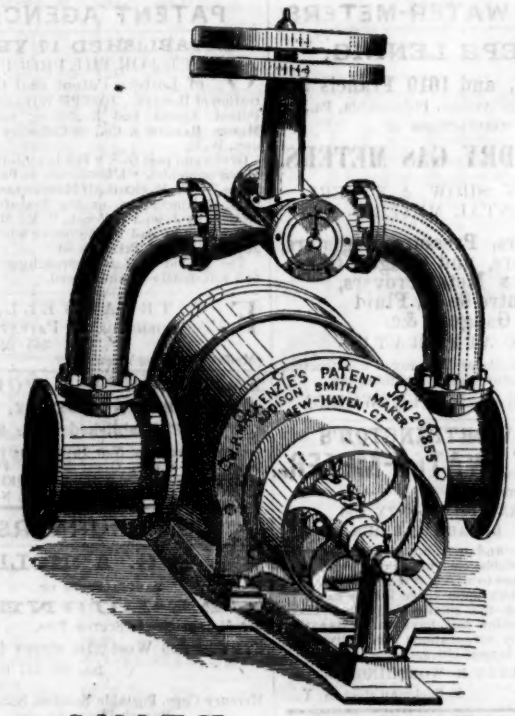
## THE LENOIR GAS ENGINE

**Requires no Fire and makes no Smoke,**

**No Noise, no Dirt, and is thoroughly safe.**

It is propelled by the expansion of Air, dilated by the combustion of Gas within the cylinder, ignited by the

## ELECTRIC SPARK.




## SMITH & SAYRE,

Sole Proprietors and Manufacturers of

# THE MACKENZIE PATENT GAS EXHAUSTER

AND

## PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. uel. Address SMITH & SAYRE, 458 Broadway, New York.

## HARRIS & BROTHER,

## PRACTICAL GAS METER MANUFACTURERS,

Continue, as heretofore, at their old Establishment,

**No. 1117 CHERRY ST., PHILADELPHIA,**

TO MANUFACTURE

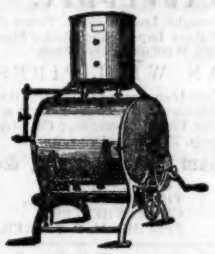
WET AND DRY GAS METERS (Consumers'),
STATION, EXPERIMENTAL AND SHOW METERS,
GLAZED METERS, METER PROVERS, AND PHOTOMETERS,
GOVERNOR AND CENTRE SEAL DRUMS,
FLUID AND PRESSURE GUAGES,
PRESSURE REGISTERS AND INDICATORS, &c., &c., &c.

All our work warranted. All orders addressed to
HARRIS & BRO., 1117 Cherry Street, Philadelphia.

## DRAKE'S

PATENT

# AUTOMATIC GAS MACHINE.



THIS MACHINE, which has been in constant use for more than two years, is now acknowledged to be the

**Most Convenient,**
**Simple, and**
**Efficient Method**

OF LIGHTING BUILDINGS OF ALL KINDS, out of the reach of regular gas-works, ever brought to public notice.

The SIMPLICITY OF THE APPARATUS, its ENTIRE FREEDOM FROM DANGER, the LITTLE ATTENTION REQUIRED, the EASE WITH WHICH IT IS MANAGED, and THE CHEAPNESS and SUPERIORITY OF THE LIGHT, has gained for it the favorable opinion of those acquainted with its merits.

The Machine takes up but little room; no disagreeable odor is experienced in its use; no fire is applied to the apparatus at all; it can be attached to ordinary gas-pipes used for coal-gas, and is burned through the same kind of fixtures.

These Machines are manufactured in Boston, by the AUTOMATIC GAS-MACHINE CO., and are for sale at their Store, 78 Washington street, Boston, and also at the Agency, MITCHELL, VANCE & CO.'s, No. 620 Broadway, New York.

For further particulars, address—

**MITCHELL, VANCE & CO.,**
620 BROADWAY, NEW YORK CITY.

## PRINCE'S METALLIC PINT,

AN INDESTRUCTIBLE COATING FOR

**IRON, TIN, and WOOD.**

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

*Terms, by the Barrel or Half Barrel, Four Cents per Pound.*

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

Also, Prince's Imperial Black Paint, and Prince's Protoxide of Iron.

DANIEL SLOAN, General Agent,
115 LIBERTY STREET, NEW YORK.

*Local Agents*—S. R. WILLIAMS, 204 South Front st., Philadelphia.
CALVIN GAY, 29 Doane st., Boston.

THE

# STANDARD Gold Company

**OF COLORADO.**

DIRECTORS,
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EDWARD WILLIS,
LIVINGSTON SATTERLEE,
ETHAN ALLEN,
S. A BANKS,
SYLVESTER TAYLOR.

President, ROBERT BOWNE.
Secretary, F. A. MITCHEL.

MINES on FISK LODE,
BOBTAIL LODE,
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And requires less than half the quantity to give the same degree of strength, and its use proves it at 30 cents a pound to be cheaper than Maricaibo coffee at 15 cents a pound.

Neatly packed in pound papers, with full instructions for use on each label—in SIXTY POUND BOXES. Price, 30 cents per pound. A liberal discount to the trade.

Manufactured by the PEOPLE'S PROVISION CO., 268 Greenwich street, N. Y., to whom all orders may be addressed.

Sold by wholesale Grocers and Druggists.

# Glycerin for Gas Meters.

This article is superior to any fluid ever before used for Wet Meters, and we cannot better set forth its advantages than by giving the following letter from the Superintendent of the Covington Gas Co. The superiority of our Glycerin over all others in the market, for this purpose, is admitted by every Company that has used it. We have sold, the past winter, to the Cincinnati Gas-Light and Coke Co ; to the Gas Companies of Covington, Ky. ; Dayton, Springfield, Portsmouth, Urbana, and Piqua, Ohio Richmond, Ind., and Buffalo, N. Y , to whom we refer.

Glycerin is much cheaper than Whisky is now, or likely to be hereafter, and not evaporating, greatly increases the economy of its use.

OFFICE OF THE COVINGTON GAS-LIGHT CO.
COVINGTON, KY., Feb. 18, 1864.

MESSRS. W. J. M. GORDON & CO. :

Dear Sirs,—It affords us great pleasure in testifying to the superiority of the Glycerin Fluid purchased from you for filling the Wet Meters now in use by the Covington Gas-Light Company.

The difficulty of finding a non-evaporating and anti-freezing mixture for Wet Meters, has, in my opinion, been overcome by the use of your Glycerin Fluid.

I have had it in constant use for the past four months, and during that period the thermometer has ranged as low as 14° below zero, and after careful examination, I have found the fluid in the same condition as when first put in the Meters, and without the slightest discoloration.

Its non-evaporating quality does away with the hitherto unavoidable expense of filling the Meters monthly, and renders Wet Meters no longer objectionable.

In fact, I can cheerfully recommend it as being cheaper and better than any other Fluid or Mixture now in use.

Very respectfully,
S. S. STRATTON, *Sup't Cov. Gas Co.*

We have been engaged in Manufacturing Glycerin the past six years, and from our advantage in material and the large amount we make, are enabled to offer it lower than any manufacturer in this country. We will be pleased to quote prices or to give further information.

**W. J. M. GORDON & BRO.,**
MANUFACTURING
## CHEMISTS & DRUGGISTS,
**N. E. Cor. Central Avenue & Eighth St.,**
Laboratory, Miami Canal, bet. Third & Fifth Sts.,
CINCINNATI. O.

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**The most Useful Invention of the Age!**
PATENT
## COSMOPOLITAN FURNITURE PASTE!
FOR POLISHING AND RESTORING
**Furniture, Pianos, Marbles, Carriages,**
&c., &c.,
SUPERIOR TO VARNISH.

☞ *DRIES INSTANTANEOUSLY.* ☜

It brings out the grain of the wood in all its original beauty, and immediately after being applied, the article polished is perfectly dry, thus possessing a very great advantage over varnish or any kind of liquid polish.

*It will keep in any climate, and is always ready for use.*

ONE BOX IS SUFFICIENT TO RESTORE AN ENTIRE HOUSE OF FURNITURE.

**Price 75 Cents per Box. . Double size $1.25.**
Each package bears our trade mark.
*A LIBERAL DISCOUNT TO DEALERS.*

For sale Wholesale by
**H. B. HERTS BROS.,**
52 JOHN ST., N. Y.

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BY ROYAL LETTERS PATENT.

## HE T'S & CO'S
AMALGAMATED
## ALUMINUM, ZINC AND PLATINA
# PENS.
WARRANTED ANTI-CORROSIVE.

In introducing this invention, Messrs. HERTS & Co. beg to call attention to the following advantages combined in these Pens:

They possess the Anti-corrosive properties of the Gold Pen.

The Freedom of the Quill, and

The Flexibility of the Steel Pen.

Thus *combining* in *themselves* every advantage found in other pens; and by their anti-corrosive properties entirely obviating all the objections hitherto existing against the use of Metallic Pens

Another advantage peculiar to these Pens, is that they *improve* after being a *short time in use*, and may be left in the ink without fear of injury, as they *never need wiping*.

THE No. 808 "medium points," are adapted for *office use* and *general business purposes*.

THE No. 909 "extra fine points," are adapted for *Ledger, Heading, Posting, Engrossing, Ladies and School use*.

The undersigned have given HERTS & Co's Pens a trial, and are satisfied to recommend them to the general public.
FOWLER & WELLS.

**Manufactory, Bradford Works, Birmingham,**
ENGLAND.

Orders for the United States, Canada, South America, and the West Indies, must be addressed to

**H. B. HERTS, 52 John St., New York,**
SOLE CONSIGNEE.

from whom samples may be obtained *gratis*, on application by mail or personally.

The Am. Advg. Agency, 389 Broadway, N. Y., will receive orders for the above-named Pens.

*New York, April 18th, 1864.*

* * * * * *

We respectfully invite your attention to and consideration of the justly celebrated and reliable remedy for DYSPEPSIA, HEARTBURN, DEBILITY and PROSTRATION. The Proprietors are proud to acknowledge the unparalleled success which has attended the sale of their valuable preparation, known in nearly every portion of the civilized world as the

## "GOLDEN BITTERS."

We risk nothing when we term them a *valuable preparation*, for they are one of the few articles of the present day which are not a humbug; and we are willing and able to satisfy any person or persons who will call upon us, that the celebrated "GOLDEN BITTERS" are a genuine *bona-fide hygienic* article. It is the wish of the proprietors that the virtue of the article be tested before condemning. A decision of their merits by any one who has tried them, is worth a million of purchased bogus testimonials.

### For Creating a Healthy Appetite

they are invaluable, and are unequalled as a TONIC. They are mild in their action, and operate by giving *vigor* and *strength* to the system,—not by any change they produce in the solids, but through the medium of the living principle.

### They are Purely Vegetable,

being composed of Gentian Root, Calamus, Sassafras, and many other remedial agents of the Vegetable world, all preserved in Jamaica Rum and Sherry Wine.

### As a Beverage,

They are the most *wholesome, invigorating* and *palatable* stimulant ever offered to the public And the fact of their being prepared chemically and scientifically, precludes the possibility of a bitter, unpleasant taste, common to Bitters generally offered for sale. We especially recommend them to LADIES, and particularly to those suffering from

DEBILITY, WEAKNESS, AND PROSTRATION.

Half a wine glass of these "Bitters" three or four times a day, will produce a remarkable healthy change in persons greatly debilitated.

The "Golden Bitters" have been tried and not found wanting. They are put up in our own *Patent* quart bottles, and for sale by Druggists, Grocers, &c., throughout the world. Each bottle bears a fac-simile of the signature of Hubbel & Co.

GEO. C. HUBBEL & Co , Sole Proprietors.
CENTRAL DEPOT, American Exp. Building, New York.

THE GOLDEN BITTERS.—We are not an advocate of stimulants of an alcoholic character; indeed we deprecate this "daily tonic" idea—this "morning toddy" which we see offered in all sorts of shapes as a recuperator, invigorator, revitalizer, &c. As a rule all artificial stimulants are dangerous remedies, and must be taken into the system as you would mercury or arsenic, in very small doses But we have had an opportunity to try the now well-advertised article known as Hubbel's Golden Bitters, and are frank to say that where the system needs building up, where a stimulant is required to aid nature in restoring a lost appetite and infusing a vigorous action to the debilitated functions, we can recommend these Bitters. Hubbel's Golden Bitters are evidently intended to improve the debilitated human system, rather than to tickle the palate, and are, therefore a harmless and safe remedy to keep in the house.—*New York Weekly Day Book.*

YONKERS, May 9th, 1864.

MESSRS. GEO. C. HUBBEL & Co. :

GENTS,—Having used only two bottles of your "Golden Bitters," I can recommend them with the utmost confidence as a Tonic, and particularly for a change of diet and water. It is as well for ladies and children, giving them part of a wine glass two or three times a day. Yours respectfully,
GEORGE O. BARKER.

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## EAGLE GAS STOVE WORKS.

# Cookng & Heating
## BY GAS.

**No Smoke! No Dirt No Smell!**

## The "EAGLE" Gas Stoves

Will BOIL, BROIL, ROAST, BAKE, TOAST,

STEW, and HEAT IRONS

☞ CHEAPER
## THAN COAL OR WOOD.

I have on hand and make to order STOVES and FURNACES for CHEMISTS, TINNERS, BOOKBINDERS, DENTISTS, TEA STORES, VULCANIZING STOVES, PHOTOGRAPHERS' OVENS, &c., and for TAILORS' and LAUNDRY IRONS.

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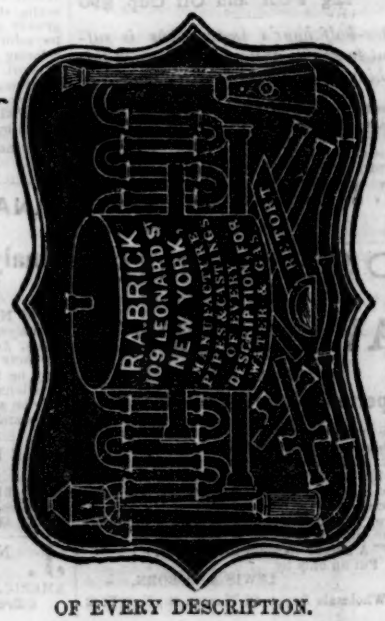


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